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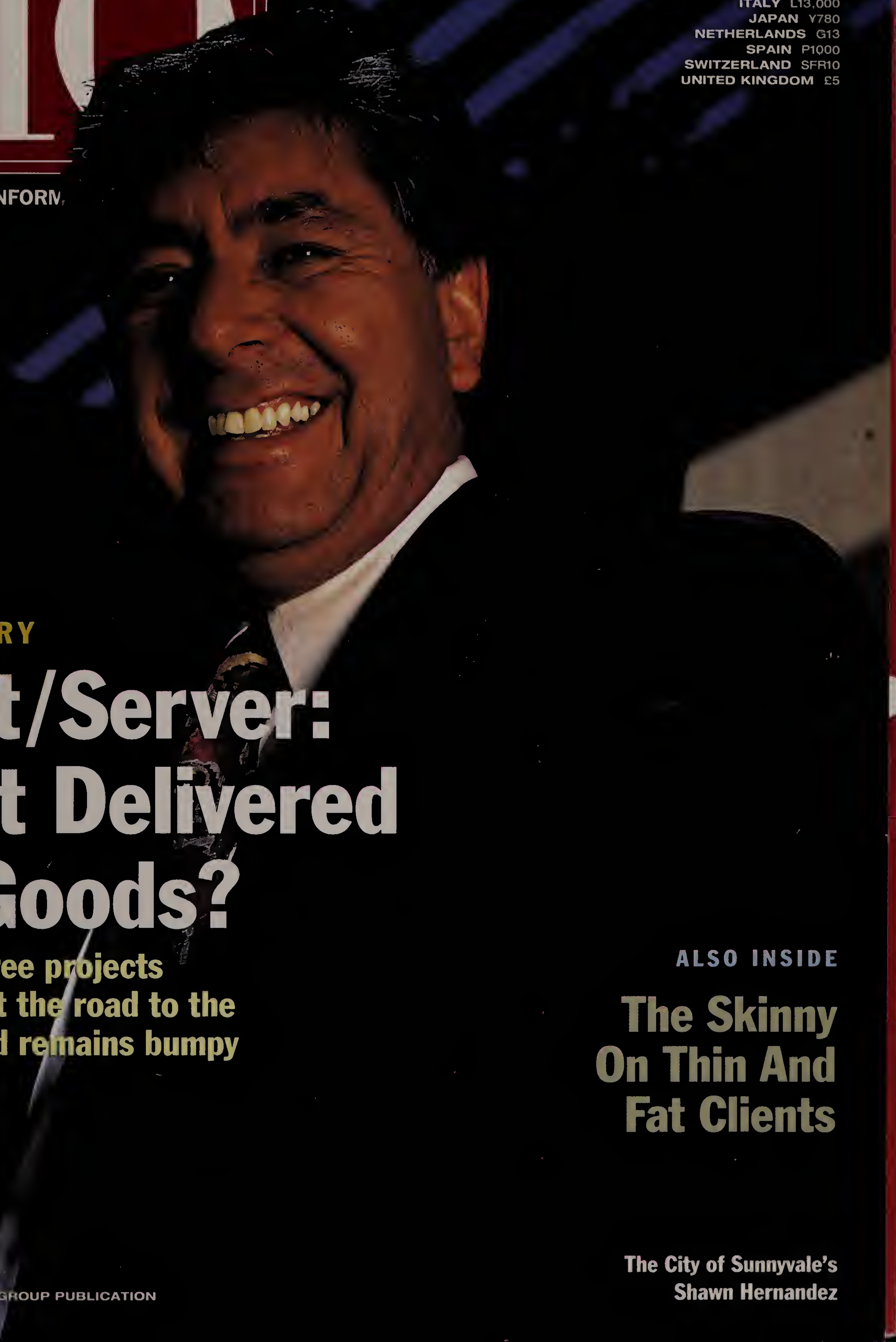

COVER STORY

Client/Server: Has It Delivered The Goods?

We revisit three projects and learn that the road to the promised land remains bumpy

ALSO INSIDE

The Skinny On Thin And Fat Clients

The City of Sunnyvale's
Shawn Hernandez

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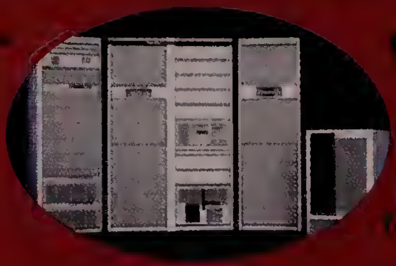

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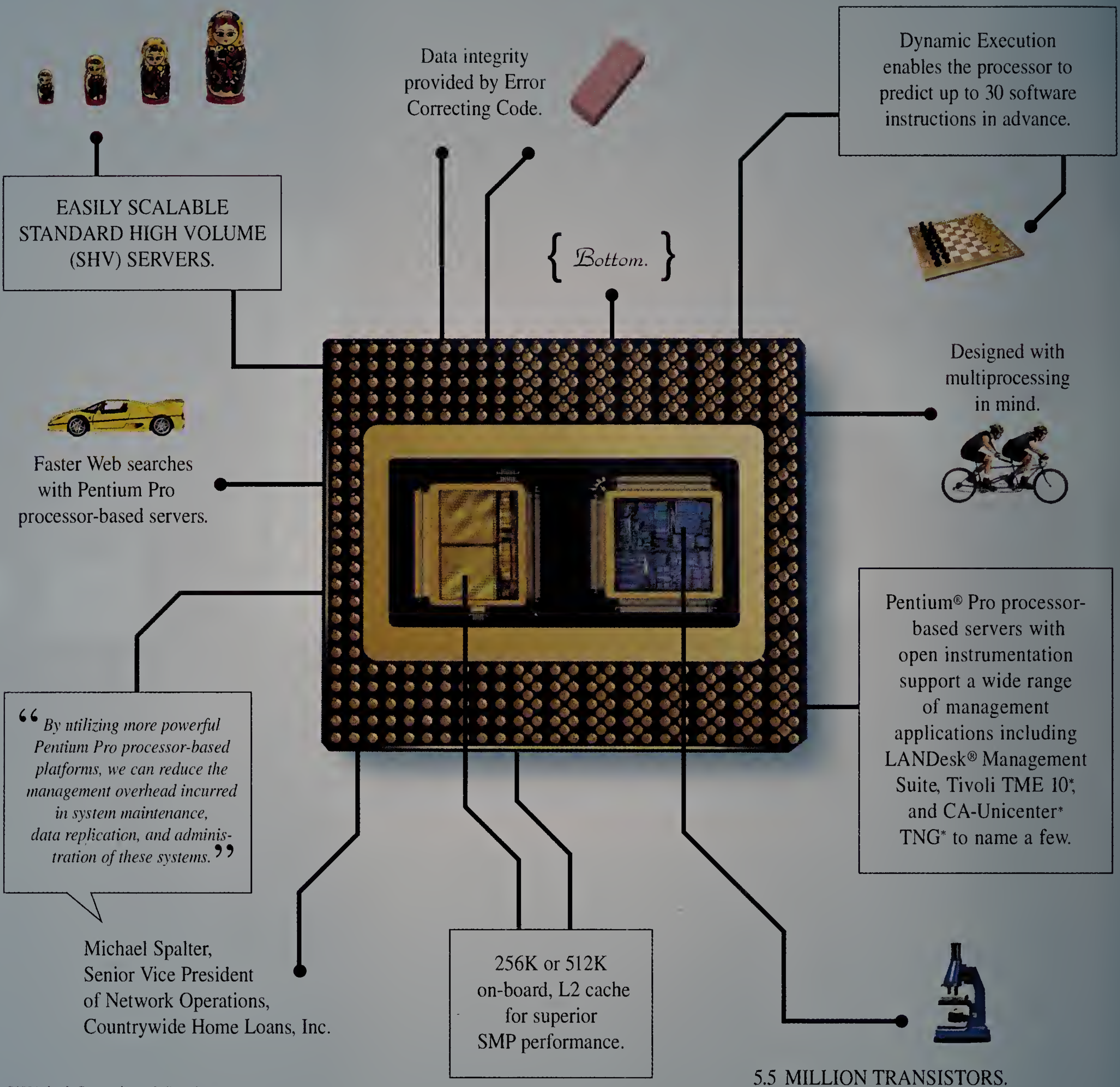

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{ Bottom. }

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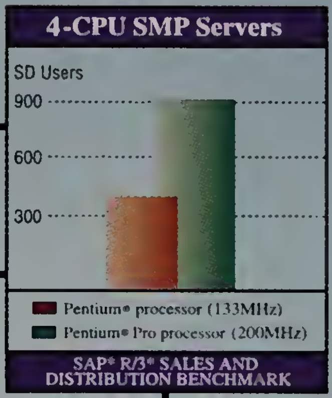

The SAP R/3 Sales and Distribution (SD) benchmark measures the number of concurrent benchmark users and the average response time that they experience. The benchmark result was certified by SAP AG, Walldorf, Germany as of 5/96.†

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COVER STORY

CLIENT/SERVER REVISITED 60

Triple Replay

Now that the hype, hoopla and hurrahs over client/server have quieted a bit, three organizations review the sometimes bumpy migration from mainframes.

By Peter Fabris

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Sending software development projects to another continent isn't without risks. But if the project is right—and properly managed—going offshore can be just the ticket for CIOs seeking high-quality, low-cost work.

By Lynda Radosevich

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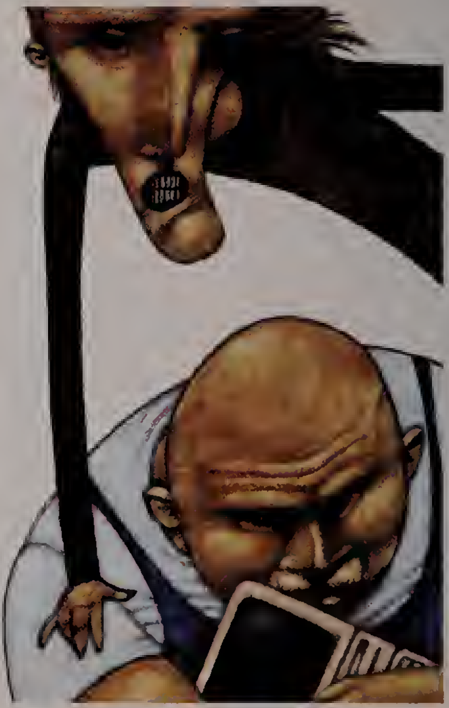
Thick and Thin of IT

Partitioning applications for client/server environments is a complex but rewarding goal.

By Joe Mullich



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Rocket Science

When your business *is* rocket science and your number-one customer isn't buying many rockets anymore, you've got to rethink your whole business strategy. That's what happened at Hughes Electronics. Here's how IS helped make it all work.

By Derek Slater

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THE I.S. ORGANIZATION 30

INSIGHTS: FULL-CIRCLE SCRUTINY

Using 360-degree surveys and other gap analysis tools can promote better service from a company's own support departments.

By Lawrence Serven

RSVP

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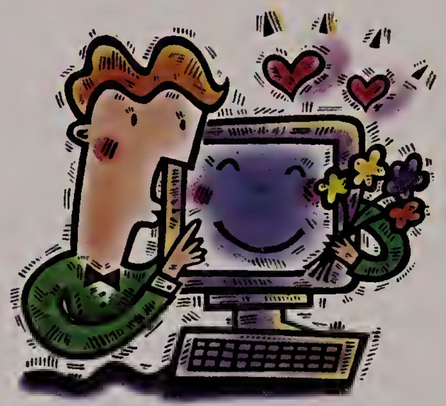

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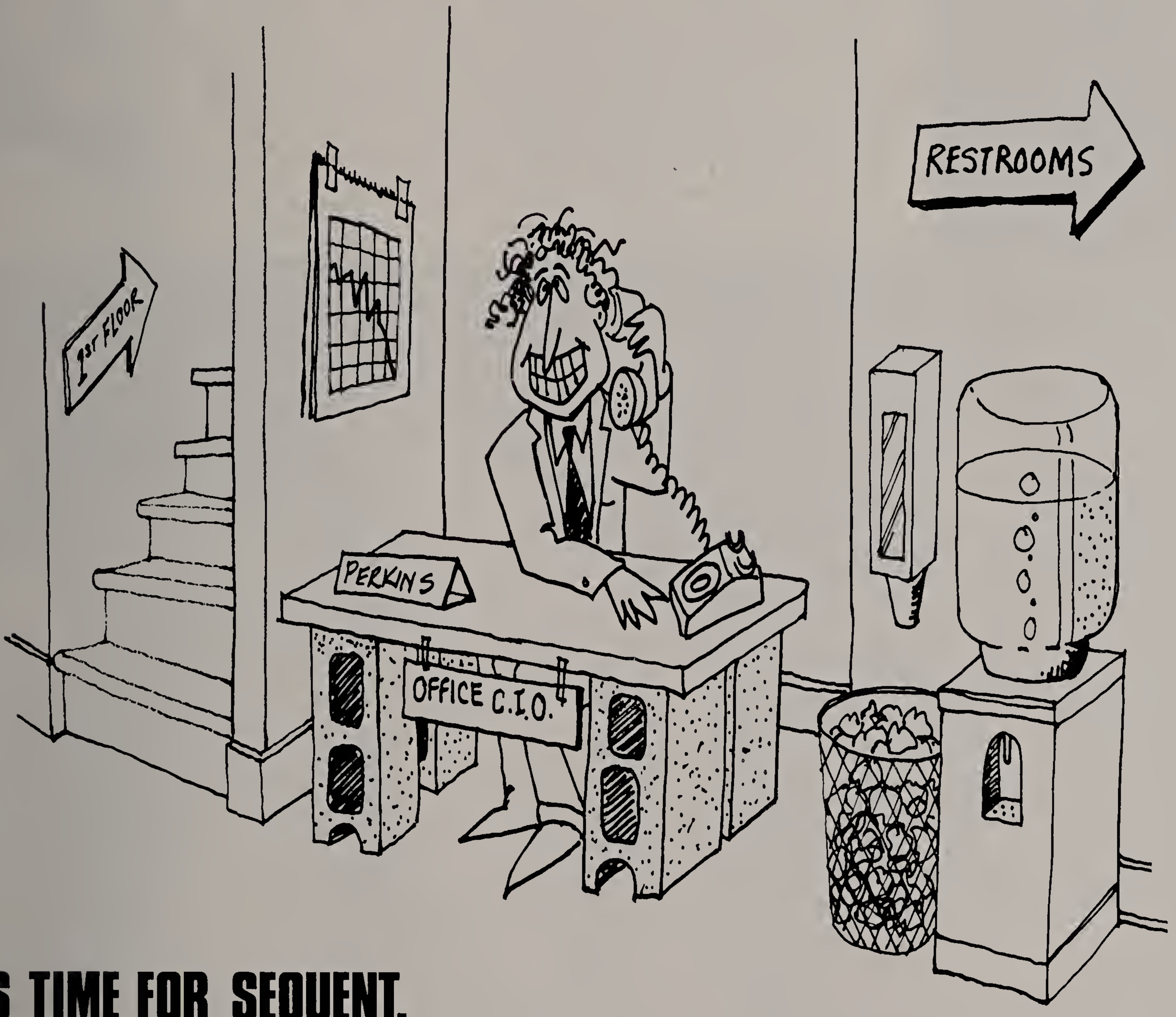
"BUYING THE *RIGHT* COMPUTER CAN MOVE YOU IN THE WRONG DIRECTION."



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Over the past year or so, we've been asking our readers for feedback, input, commentary. We have a very selfish motive: The more we learn about what's important to you, the easier it is to make *CIO* a relevant, compelling magazine.

And readers are beginning to respond. E-mail has helped. Its 10-minute, one-step process is so much less daunting than the multistep production of typing and mailing a letter.

We've taken your input to heart. In the next issue, you'll notice some improvements to *CIO*. We're revamping our columns to be more topic-focused and relevant. We're polishing the magazine's look and feel. And now that we're getting correspondence on a regular basis, we will begin to publish your letters.

Our first reader feedback column will appear in the Sept. 15 issue of *CIO*. In future months, we hope to print a mix of letters on a variety of topics that are of interest or concern to you.

Do you disagree with a position one of our columnists has taken? Think we missed an important angle on a story? Have a viewpoint or opinion of your own you'd like to get across? Send it in. If your message is clearly stated and of interest to our audience at large, we'll make every effort to get it into print.

Not sure who to direct your message to? In addition to my e-mail address listed here, you'll find the addresses of writers at the end of their articles. You can also access the full editorial staff listing on our Web site at *www.cio.com/CIO/editstaff.html*.

Your input is important to us. Perhaps more to the point, it's important to your peers. So let us know about that project you're wrestling with or that new change-management technique you've found so successful. If we think it's something others will benefit from, we'll publish it in the magazine and help you continue the networking you've begun through our articles, our conferences and our online forums.

Abbie Lundberg

Editor
lundberg@cio.com

P.S. We want to know what you think about electronic commerce. Please help us sharpen our focus by completing our fax-back survey on Page 116.

CIO

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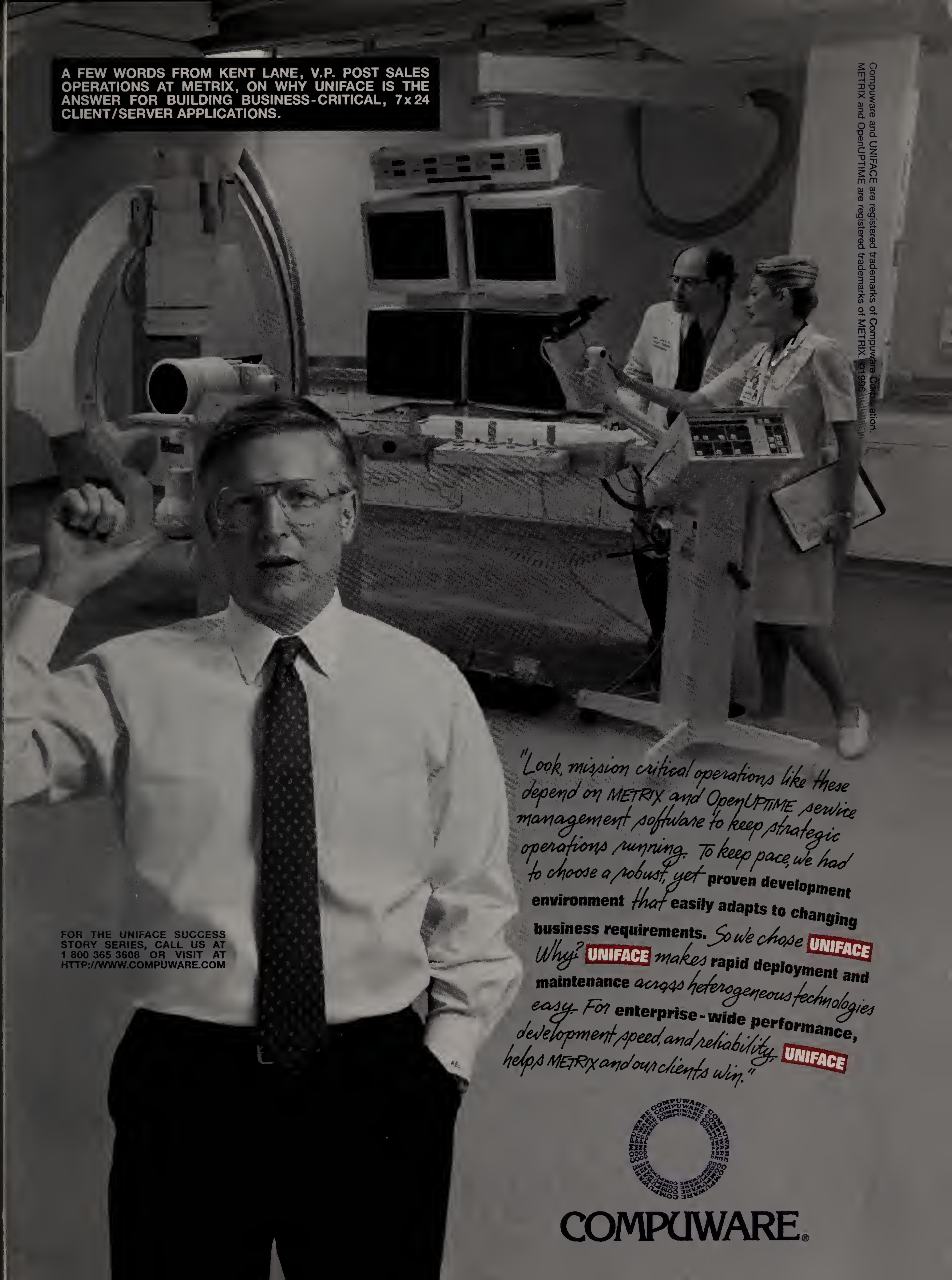

A FEW WORDS FROM KENT LANE, V.P. POST SALES OPERATIONS AT METRIX, ON WHY UNIFACE IS THE ANSWER FOR BUILDING BUSINESS-CRITICAL, 7 x 24 CLIENT/SERVER APPLICATIONS.

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To some, the idea of Web site registration might seem to run counter to the original raison d'être of the Internet—free access to information with the commercial aspect kept to a subtle minimum. But businesspeople have discovered that, as with all good things, the Internet (via the Web) is yet another channel through which to conduct business. And they are right. Companies such as Levi Strauss, Federal Express and Boeing are reinventing their businesses through that electronic medium.

Publishing companies, too, are using the Web to expand services to their readers, and we are one such company. In order to provide value to our readers, we need to know more about them. By obtaining a profile of our Web site visitors, we are more likely to provide the information they want most.

Keeping in mind the Internet's original premise, we are setting up an optional registration process. Most of the information you currently find at *www.cio.com* will be accessible if you don't register, but those who register will be privy to material that we deem "worth the price of admission." Registration will put you inside the WebMaster-CIO Inner Circle, where you will find discussion forums, extensive article archives, online seminars and job postings.

And we've made the registration process as painless as possible. If you are a subscriber to *CIO* or *WebMaster*, simply enter your user name and subscriber ID number in the space provided. That's it. You can find your subscriber ID number on the mailing label on the cover of this issue. If you are not a subscriber, you'll need to answer a few questions—it should take you less than five minutes.

We hope to see you in the Inner Circle.

P.S. The fall CIO Perspectives conference, "IT Turnarounds, Transformations and Recoveries," will be held Oct. 13-16 at La Quinta Resort in Indian Wells, Calif. Keynote speaker Gary Hamel, a professor at the London Business School and chairman of Strategos, will provide insight to help companies that are restructuring, anticipating radical business-process transformation or recovering from difficulties. You can enroll by calling 800 366-0246 or visiting our Web site at *www.cio.com*.

Coming In CIO

2000 Stories

Everyone may be aware of the impending millennium date-change disaster, but not everyone is doing something about it. In fact, experts predict that one in five companies will go out of business because their systems were not adapted in time. While some companies drag their feet, others have been working for years to rewrite code modules, create separate programs for date calculations, replace old software in client/server migrations—in the meantime reviving the need for Cobol programmers. Such activities illustrate what IS executives are stressing: Companies need detailed and disciplined conversion plans, and they need them right now.

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TWO CENTS AND THEN SOME

It began with an impossible challenge. A CEO named Martin Edelston was dared by Peter Drucker seven years ago to make meetings at his publishing company *interesting*. "They are pretty bad," Edelston admitted. "But aren't *all* meetings pretty bad?"

Still, showing all the confidence of the queen in *Through the Looking Glass*, who declared that she believed as many as six impossible things before breakfast, Edelston gave it a whirl. At Drucker's suggestion, he started asking employees to bring two new ideas to every meeting and began offering small incentives, such as candy bars or small cash awards, for the best ideas. Today the program, called I-Power (as in ideas, invention, ingenuity, etc.), is used in hundreds of companies to cull ideas from employees on how to run their businesses better. Edelston has also written a book on the subject and founded the Greenwich Institute for American Education, a nonprofit organization promoting the I-Power premise that most good ideas come from the people in the trenches, *not* managers. (The program has been tested as well in 30 secondary and elementary pilot schools.)

As a result of I-Power, Edelston's company, Boardroom Inc., has gone from a high turnover rate to one of virtually zero. Results from other companies include the following:

- The Los Angeles Dodgers restructured expense accounts for scouts using direct deposit accounts so that scouts get reimbursed faster. The team also implemented fitness programs, run by team trainers, that are available to all employees. Rewards for good ideas include "Dodger Dollars," which are redeemable for club merchandise.
- Eastman Kodak Co.'s Site Management Organization built an ergonomically correct counter in the stockroom. Also, wooden shelves formerly scrapped by departments are now recycled. Rewards include blank videotapes, rolls of film and movie passes.
- Ford Motor Co.'s Computer Aided Engineering Department developed a "buddy system" to acclimate new hires. And workers are required to spend at least 30 minutes on each of their projects every day to avoid the dreaded "out of sight, out of mind" syndrome. Ford's corporate policy prohibits cash awards, so the unit purchased a communal stuffed Dogbert, the canine sidekick from the *Dilbert* comic strip. The employee with the most idea points each week earns temporary custody of the roly-poly pup.

For more information on I-Power, call 800 625-2424.

–Cheryl Dahle

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COUNTING THE MINUTES

When you're racing the clock, stopping every 15 minutes to record exactly what you're doing can be downright annoying. And when five o'clock rolls around, it's often hard to remember exactly what you did between, say, 10:45 and 11:15. Thanks to real-time recording systems, some of the hassles of keeping a paper-based time log may soon be a thing of the past. Open Doors Software Inc. of Minneapolis has introduced KeepTime, a time and billing recording system that runs in the background on users' desktops.

A pop-up stopwatch on users' screens records real-time data for each task, which can be transferred to a summary log as a permanent record and then sorted by date and client. Users simply select a project or client name and click on the "stop" and "go" icons to record time for each task.

The $59 single-user version can attribute hourly rates to each task, track and record Internet online time, and be exported to other files for time recording, cost accounting or billing. For more information, call 800 923-TIME or download a free evaluation copy of KeepTime from the Open Doors Software Web site at *www.opendoors.com/kt/*.

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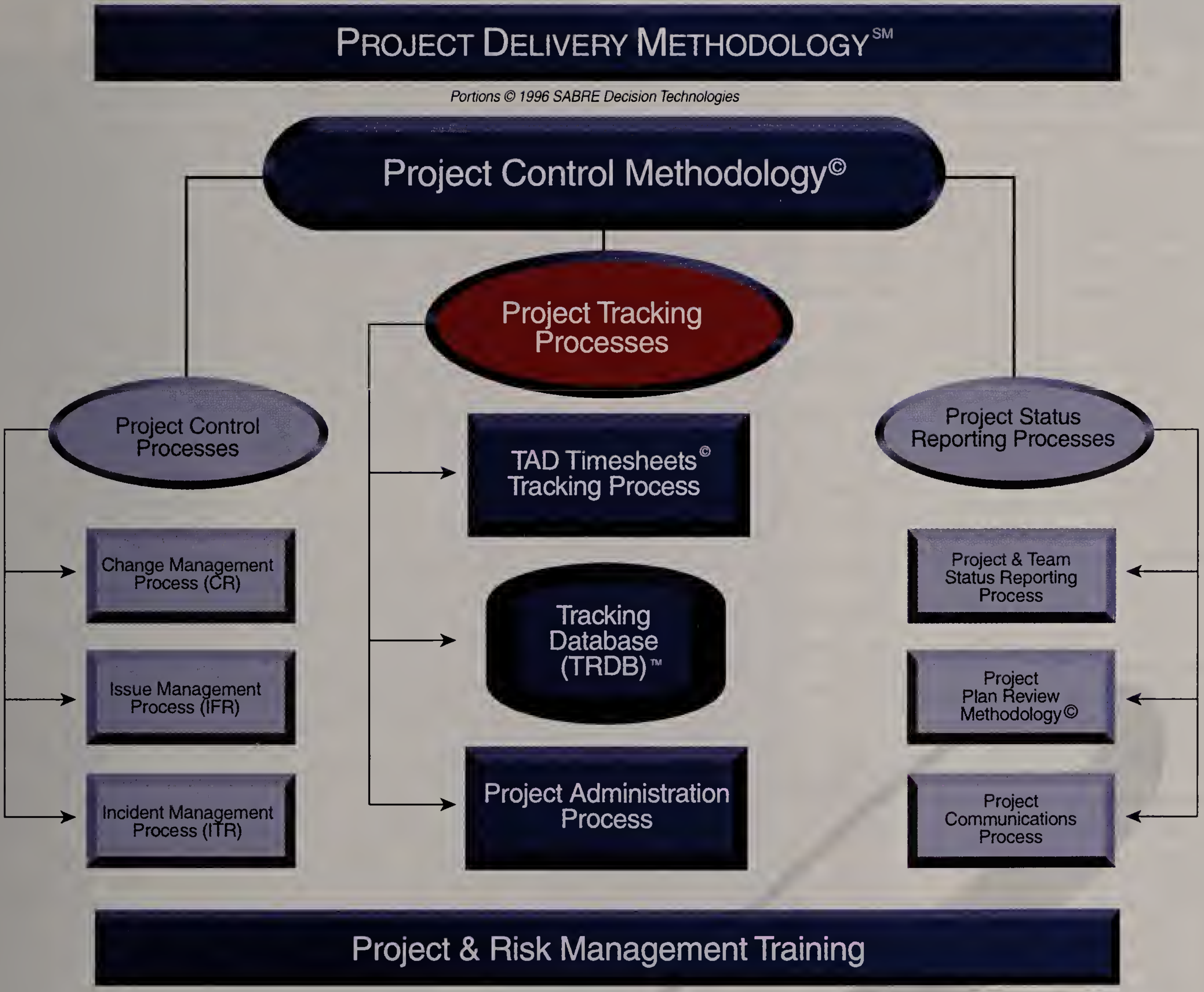
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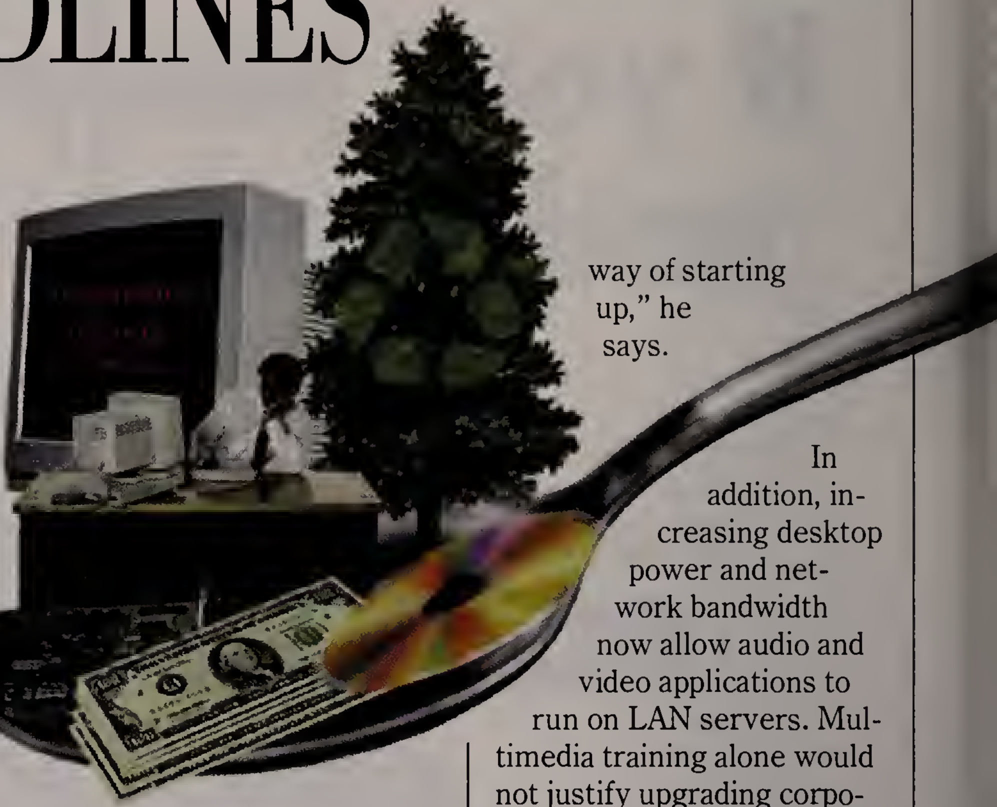

COMPUTER-BASED TRAINING

A SPOONFUL OF MULTIMEDIA

Tell your end users you've scheduled them for training and they'll probably groan in anticipation of lost workdays, droning lectures and soporific overhead projector presentations. Although they may not shout for joy if you give them multimedia training tools instead, at least they can schedule lessons at their convenience—and re-run a session if they happen to doze off. Even better, they're more likely to remember what they learn, fewer trees will be killed in the process and there's a good chance your company will save money.

Today's multimedia training products run the gamut from simple point-and-click tutorials to sound-and-fury audio/video presentations streaming from the LAN server. Some companies, like Motorola Inc., have even built virtual reality training environments to save the expense of flying users to a central training location. Employees need only don a VR headset to tour a virtual manufacturing facility that the company built using software tools from Palo Alto, Calif.-based Superscape Inc.

Although corporations have been flirting with computer-based training in one form or another for years—with varying degrees of success—a few factors are beginning to make it more viable.

First, the infrastructure needed for demanding multimedia applications is just falling into place. CD-ROM drives have proliferated and the disks' interfaces have taken a dramatic turn for the better, says Phillip Shuey, executive director of the International Association of Audio Visual Communicators in San Diego. "In the beginning, it was abysmal. Every CD had a different way of starting up," he says.

In addition, increasing desktop power and network bandwidth now allow audio and video applications to run on LAN servers. Multimedia training alone would not justify upgrading corporate networks, but now that client/server and Internet applications are driving these hardware upgrades, training applications get to come along for the ride, says Cheryl Ball, director of multimedia research for Business Research Group in Newton, Mass.

Still, multimedia training must be implemented thoughtfully. Multimedia works best, says Ball, when it is targeted at very specific, core business processes that measurably affect employee productivity. On top of that, technical issues must be addressed. "Sometimes there is a lot of agony just getting Windows not to crash every five minutes with these very demanding applications," she explains.

Success also hinges on fostering cultural change: Users don't automatically grab a CD-ROM and scurry off to their desks with the goal of becoming experts. "Learning with a CD-ROM is different from learning through an instructor," says June Maul, director of worldwide product development for AT&T School of Business. "[Multimedia training tools have] to be used proactively, and you have to get people over the barrier of feeling uncomfortable."

–Derek Slater

MY FRIEND, MY COMPUTER

Ever feel like a traitor to your computer when you sit down at someone else's? The keys clatter oddly beneath your fingertips, the mouse just doesn't respond the way you expect it to and the background pattern on the desktop seems shockingly different—all reminders of your betrayal. You rush back to your own machine, and all is well again. After all, computers have feelings, right?

Well, yes. At least that's what many computer users believe, according to several studies conducted by Stanford University professors Byron Reeves and Clifford Nass. Their research suggests that people interact with computers much as they do with other human beings, sometimes assigning them personality traits and other human characteristics.

"In computers, better voice output, better screen displays and more moving pictures will increasingly fool users into treating the computer as if it were human," says Nass.

The studies also revealed that computer users' evaluations of their computers' performance were much more favorable when they were asked to rate it by the computer itself rather than when they were asked by another computer or via a paper questionnaire.

So if you find yourself worried that you're too "polite" to your computer, you're not alone. You just may be working too much. ■

PHOTO-ILLUSTRATION BY GUY CRITENDEN; ILLUSTRATION BY FRAN O'NEILL

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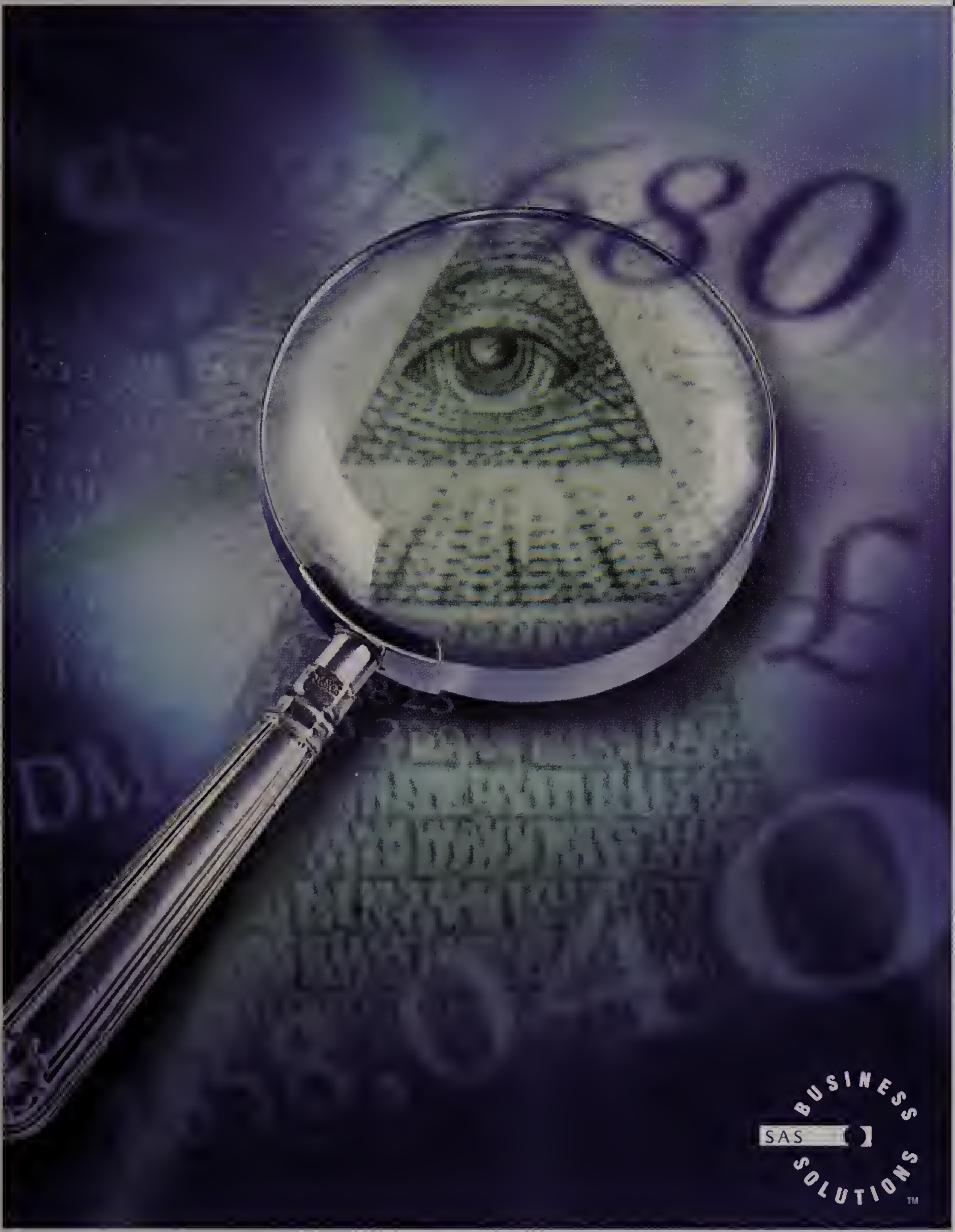

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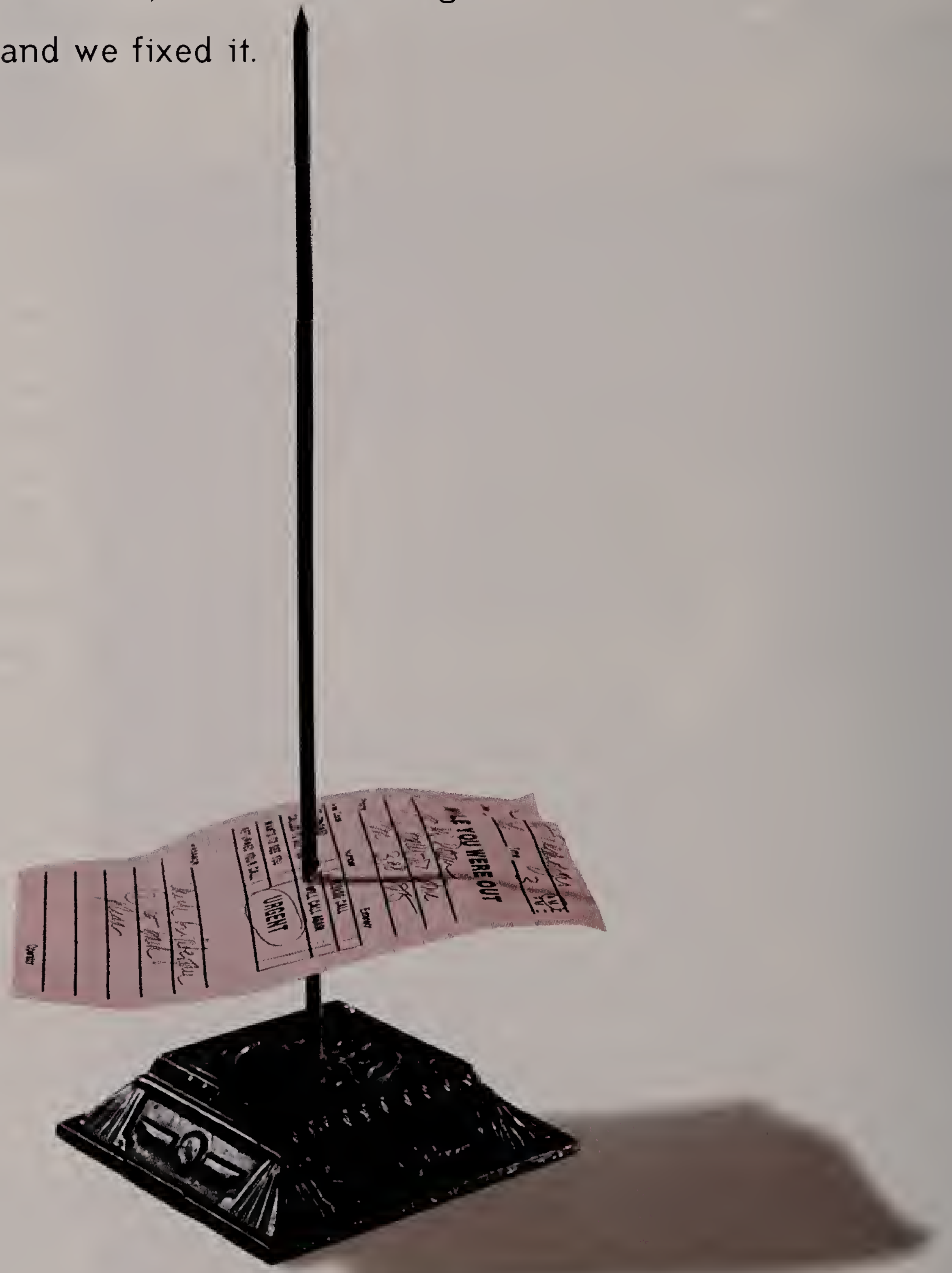

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TRENDLINES

I.T. IN PRISONS

FELON TELEVISION

Courtroom dramas—whether the live O.J. variety or the make-believe grit of shows like *Law & Order*—can make for some pretty compelling television viewing. Now courts themselves have turned to television, not to garner high ratings, but to save money and increase safety. According to the National Center for State Courts based in Williamsburg, Va., more than 200 state courthouses use videoconferencing for proceedings involving prisoners. The practice not only cuts costs by reducing the need to transport inmates to courthouses for routine appearances but also reduces the opportunity for escapes and injuries to guards.

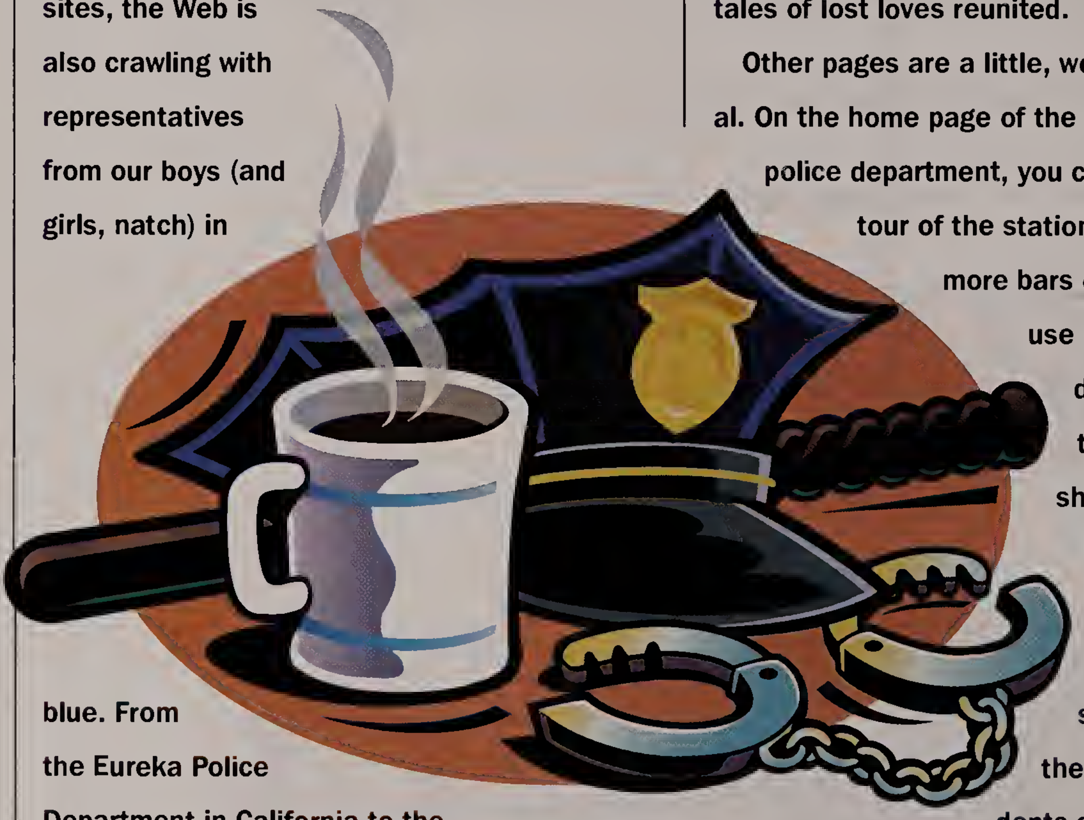
Connecticut began experimenting with teleconferencing this year. So far, prisoners' tele-court appearances have been restricted to uncontested procedures, such as a prisoner petitioning the court to change his or her name, says Howard Emond, trial court administrator in the Tolland Judicial District. State law prevents courts from using the technology for more involved criminal proceedings, though Connecticut plans legislative action to widen the range of tele-proceedings to include video arraignments, pleas, sentencing and the like, says Emond.

Connecticut is pleased with the video hook-up between Rockville Superior Court and the state prison in Suffield some 20 miles away, where the system is being tested. The court uses PictureTel Corp.'s Venue 2000 system running over a point-to-point T1 connection. "The quality of the sound and pictures is much better than we expected," Emond says, "and the inmates have not been intimidated by the technology."

The state anticipates significant cost savings from videoconferencing, although the fact that the expense of transporting prisoners varies widely makes it nearly impossible to say precisely how much money the technology will save. But savings of "several million dollars a year" is a reasonable target, says William Flower, director

PHOTO BY TONY STONE IMAGES/KEVIN HORAN; ILLUSTRATION BY MICHAEL LINLEY

NO DOUGHNUTS, BUT THERE'S PLENTY OF JAVA



So you think cyberspace is a lawless sort of place frequented more by libertarians and hackers than the long arm of the law? Such is the reputation, but judging by the number of sites, the Web is also crawling with representatives from our boys (and girls, natch) in blue. From the Eureka Police Department in California to the Royal Canadian Mounted Police site (disappointingly devoid of Dudley DoRight), hundreds of sites are dedicated to taking a bite out of crime. Or at least, getting in a little good PR for law enforcement agencies.

Visitors to the Unsolved Mysteries site *(www.unsolved.com)* can browse among stories ranging from missing persons to fugitives from justice. There's the case of Timothy Thomas Coombs, an anti-government activist accused of shooting a police officer (if you have a tip, call 800 876-5353), for example, as well as tales of lost loves reunited.

Other pages are a little, well, less sensational. On the home page of the Burlington, Mass., police department, you can take a virtual tour of the station (one tidbit: no more bars on the cells; they use plexiglass these days), cruise links to movies and TV shows such as *NYPD Blue*, and leave an anonymous crime tip. Lt. Fran Hart says he created the page to give residents another way to reach out to their police force. "It's a whole new way to do community policing," he says. Anti-crime organization sites, such as CopNet *(police.sas.ab.ca/)* and Kramer's Law Enforcement Links *(vader.castles.com/kramer/links.html)*, also abound. For a comprehensive list of law enforcement sites, visit *www.geocities.com/CapitolHill/1814/ira.htm#toc.* ■

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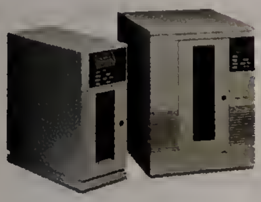

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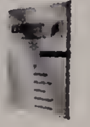

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TRENDLINES

of communications for the Connecticut Department of Corrections.

At least 29 states already use the technology, and many go beyond Connecticut's experimentation, using videoconferencing technology for misdemeanor and felony arraignments and other court appearances. The United States Supreme Court cleared the way for courts to use video arraignments for felonies and misdemeanors in a 1991 ruling, but like Connecticut, several states still have to rewrite laws to make videoconferencing appearances as legally binding as in-person proceedings.

–Peter Fabris

> **With 100 users each requiring 20 hours of connect time per month to access the corporate LAN remotely, Giga Information Group of Cambridge, Mass., calculates that a company could save $4,000 each month by linking them through the Internet.**

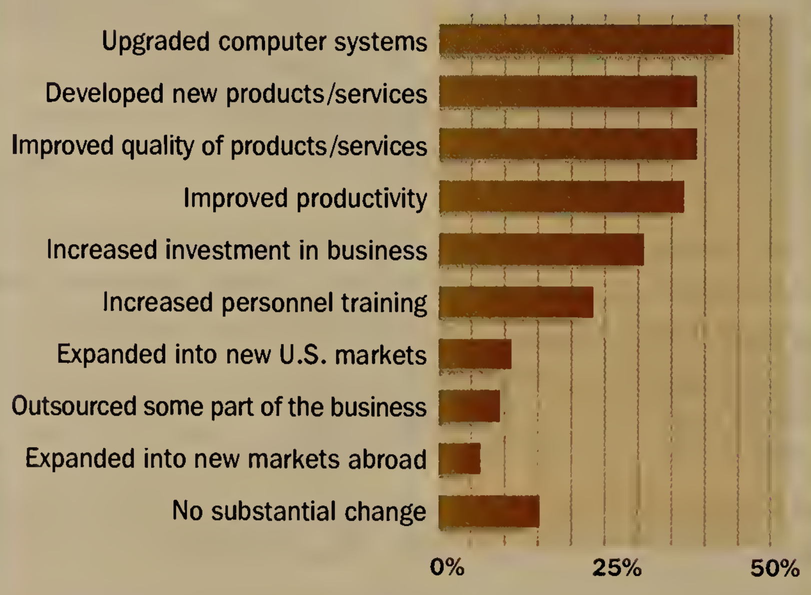
CURING VERSION AVERSION

Each new release of office software programs offers the promise of productivity enhancement. But when workers don't use the new features, investments in upgrades don't always pay off.

PinPoint, a personal productivity program from Kelly Services Inc. of Troy, Mich., helps users learn advanced features of the Windows versions of Microsoft Office, Novell WordPerfect and Lotus SmartSuite at their own pace. A "show me" feature demonstrates the best way to accomplish any task. For more information, call 810 244-4588. ▬

Not Small Change

Percentage of small and midsize businesses that made the following changes in the past year:



SOURCE: ARTHUR ANDERSEN ENTERPRISE GROUP/NATIONAL SMALL BUSINESS UNITED 1996 SURVEY OF SMALL AND MIDSIZE BUSINESSES

PLATFORM WARS

Most students still burn the midnight oil to finish a term paper or crunch out numbers for Statistics 101, but these days they do their work by the pale illumination of a computer monitor. Gazing with longing upon the market of more than 12 million U.S. college students, Microsoft Corp. recently launched a partnership with Buffalo Grove, Ill.-based Zenith Data Systems (ZDS) to ensure that students will enjoy easy computer ownership, connectivity to campus networks and the Internet, friendly software applications and that good ol' reliable PC standard. Dubbed the Campus Z-Station program, the partnership encourages students to purchase PCs through their universities. The partners have targeted 150 universities for the plan and have already kicked it between the goal posts at the University of Michigan in Ann Arbor and at Carnegie Mellon University in Pittsburgh.

But Apple Computer Corp. still boasts a 63 percent share of the K-12 market and claims that 29 percent of the college students who own computers own Macs. While Microsoft points out that the University of Texas at San Antonio built its entire network around a Windows NT Server, not more than a hoot 'n' a holler away at the University of Texas at Austin is the largest installation of Apple computers in the world—more than 18,000 of them.

All that competition makes education the pure winner. Since 1979, Apple has given $28 million to schools and educators through its Partners in Education grants program. And, at the moment, Microsoft's Windows 95 is on sale to colleges and universities for $19.95, provided at least five licenses are purchased.

Now if only someone would develop a program that could drive down tuition.... ▬

PHOTO-ILLUSTRATION BY GUY CRITTENDEN; CHART BY TERRI MITCHELL

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Address:

City: State: Zip:

1. Are you involved in management or development of World Wide Web utilization at your organization?

☐ Yes ☐ No

2. Which of the following best describes your title within your organization? *(Check one only)*

- ☐ 1. Webmaster
- ☐ 2. CEO, President, Owner, Partner, General Manager
- ☐ 3. CIO/VP of Information Systems/MIS/DP
- ☐ 4. Dir/Mgr of Information Systems/MIS/DP
- ☐ 5. VP/Dir/Mgr of Networking & Communications Systems
- ☐ 6. CFO/VP/Dir/Mgr Finance/Controller
- ☐ 7. Consultant
- ☐ 8. VP/Dir/Mgr Accounting
- ☐ 9. VP/Dir/Mgr Engineering/Manufacturing
- ☐ 10. VP/Dir/Mgr Marketing/Sales
- ☐ 11. COO/VP/Dir/Mgr Operations/Administration/Purchasing/Human Resources
- ☐ 12. New Media Specialist
- ☐ 13. Content Producer/Developer/Editor
- ☐ 14. Systems Engineer/Programmer/Analyst
- ☐ 99. Other *(Please specify)* ____________

3. What is your primary job function within your organization? *(Check one only)*

Technical Management

- ☐ 1. Webmaster
- ☐ 2. IS management
- ☐ 3. Networking/LAN management
- ☐ 4. Communications management

Corporate Management

- ☐ 5. Executive management
- ☐ 6. Marketing management
- ☐ 7. Financial management
- ☐ 8. Engineering management
- ☐ 9. Sales management
- ☐ 10. Operations management
- ☐ 99. Other *(Please specify)* ____________

4. Which of the following best describes your organization's industry or function? *(Check one only)*

- ☐ 1. Manufacturer of Computers, Communication or Peripheral Equipment
- ☐ 2. Manufacturer of other products/processes not included above
- ☐ 3. Finance: Banking
- ☐ 4. Finance: Insurance
- ☐ 5. Finance: Real Estate, Credit or Securities
- ☐ 6. Wholesale or Retail Trade
- ☐ 7. Government: Federal, State or Local
- ☐ 8. Military
- ☐ 9. Transportation: Land, Sea or Air
- ☐ 10. Education: College, University, Library, Secondary, Other
- ☐ 11. Health Care/Pharmaceuticals/Medical Services
- ☐ 12. Utility: Communications
- ☐ 13. Utility: Electric, Gas, Sanitation
- ☐ 14. Accounting or Legal Services
- ☐ 15. Online Product and Service Provider
- ☐ 16. Communications: Publishing, Broadcast, Advertising, Public Relations
- ☐ 17. VAR, VAD, Systems Integrator
- ☐ 18. Computer and Data Processing Services and Software
- ☐ 19. Business Services *(other than computer)*
- ☐ 20. Research and Development
- ☐ 21. Aerospace/Defense Contractor
- ☐ 22. Mining/Construction/Petroleum/Refining/Agriculture
- ☐ 99. Other *(Please specify)* ____________

5. What is the total number of employees: *(Check one only in each column)*

	A. In your entire org.	B. At this location
1. >5000	☐	1. ☐
2. 1001-5000	☐	2. ☐
3. 500-1000	☐	3. ☐
4. <500	☐	4. ☐

6. What are the total annual revenues of your entire organization? *(Check one only)*

- ☐ 1. Over $1 Billion
- ☐ 2. $501 Million to $1 Billion
- ☐ 3. $101 to $500 Million
- ☐ 4. $25 to $100 Million
- ☐ 5. Under $25 Million

7. Approximately how much will your organization spend in the next 12 months on computers, software, equipment and services for World Wide Web implementation? *(Check one only)*

- ☐ 1. More than $1,000,000
- ☐ 2. $500,000 to $999,999
- ☐ 3. $100,000 to $499,999
- ☐ 4. $25,000 to 99,999
- ☐ 5. Less than $25,000

8. In which ways are you/will you be involved in World Wide Web development at your organization? *(Check all that apply)*

- ☐ 1. Specify, recommend, or purchase products and services used in Web development
- ☐ 2. Develop Web content and applications
- ☐ 3. Strategic planning of Web projects
- ☐ 4. Manage the Web staff and activities
- ☐ 5. NONE OF THE ABOVE

9. Which of the following are currently in use or planned for use in your organization? *(Check all that apply)*

CLIENT OPERATING SYSTEMS

- ☐ 1. DOS
- ☐ 2. Macintosh
- ☐ 3. MVS
- ☐ 4. OS/2
- ☐ 5. OS/400
- ☐ 6. UNIX *(any variety)*
- ☐ 7. VM
- ☐ 8. VMS
- ☐ 9. VSE
- ☐ 10. Windows 3.X
- ☐ 11. Windows NT
- ☐ 12. Windows 95
- ☐ 13. Other *(Please specify)* ____________
- ☐ 99. NONE OF THE ABOVE

SERVER/NET OPERATING SYSTEMS

- ☐ 1. Apple
- ☐ 2. Banyan-Vines
- ☐ 3. IBM-LanServer
- ☐ 4. IBM-PC Lan
- ☐ 5. Microsoft-LanManager
- ☐ 6. Novell-NetWare
- ☐ 7. Windows NT
- ☐ 8. Other *(Please specify)* ____________
- ☐ 99. NONE OF THE ABOVE

PROTOCOLS

- ☐ 1. TCP/IP
- ☐ 2. OSI
- ☐ 3. SNA *(IBM)*
- ☐ 4. Appletalk
- ☐ 5. DECNet
- ☐ 6. IPX/SPX *(Novell)*
- ☐ 7. NetBIOS
- ☐ 8. X.25
- ☐ 9. NFS *(Sun)*
- ☐ 10. NetView
- ☐ 11. SNMP
- ☐ 12. Other *(Please specify)* ____________
- ☐ 99. NONE OF THE ABOVE

10. Which commercial Internet access providers do you currently use or plan to use in the next 12 months? *(Check all that apply)*

- 1. AOL ☐
- 2. AT&T ☐
- 3. BBN ☐
- 4. CompuServe ☐
- 5. GEIS ☐
- 6. IBM Global Network ☐
- 7. MCI ☐
- 8. Microsoft ☐
- 9. Netcom ☐
- 10. Prodigy ☐
- 11. PSI ☐
- 12. Sprint ☐
- 13. U B Networks ☐
- 14. UUNET ☐
- 15. Other *(Please specify)* ☐ ____________
- 99. NONE OF THE ABOVE ☐

(OVER, PLEASE ▶▶▶)

11. Please check below all the products and services that you help acquire, either through approval, planning, recommendation or specification.
(Check all that apply)

COMPUTERS/PERIPHERALS

☐ 1. Desktop PCs/Notebooks
☐ 2. PC Servers
☐ 3. Workstations
☐ 4. Unix Servers
☐ 5. RISC Servers
☐ 6. Monitors
☐ 7. Printers
☐ 8. Storage/Tape Drives
☐ 9. CD-ROM Drives
☐ 10. UPS

INTERNETWORKING/LANS

☐ 11. Local Area Networks
☐ 12. Network Operating Software (NOS)
☐ 13. LAN Servers
☐ 14. Bridges/Routers/Gateways
☐ 15. Intelligent Hubs/Hubs

WIDE AREA NETWORKING/INTERNET ACCESS

☐ 16. Modems
☐ 17. PCMCIA Modems
☐ 18. T-1/T-3 Multiplexers
☐ 19. T-1/T-3 Services
☐ 20. Fractional T-1 Services
☐ 21. Dedicated Lease Lines
☐ 22. 56 Kbps Services
☐ 23. ISDN Services

SOFTWARE

☐ 24. E-mail/Workgroup
☐ 25. Database Servers
☐ 26. PC Databases/Front End
☐ 27. Communications/Remote Access Software
☐ 28. Image/Document Management Software
☐ 29. Video conferencing
☐ 30. Multimedia

WEB SOFTWARE

☐ 31. Web Browsers
☐ 32. HTML Authoring Tools
☐ 33. VRML Authoring Tools
☐ 34. Web Publishing Tools

☐ 35. Search Tools/Engines
☐ 36. Encryption Software
☐ 37. Firewalls/Security
☐ 38. Transaction Processing
☐ 39. Consulting Services
☐ 40. Outsourcing
☐ 41. Other *(Please specify)* ____________________

☐ 99. NONE OF THE ABOVE

12. Which of the following publications do you receive addressed to you personally?
(Check all that apply)

☐ 1. Interactive Week
☐ 2. Internet World
☐ 3. NetGuide
☐ 4. WebWeek
☐ 5. Wired

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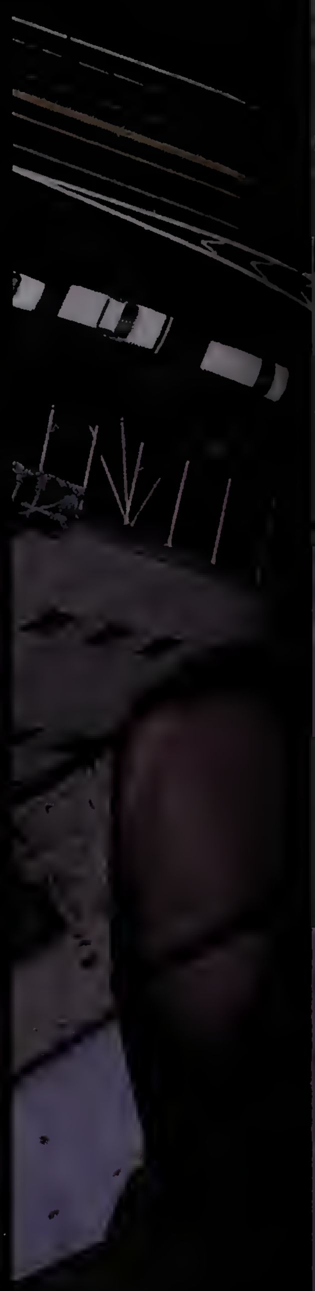

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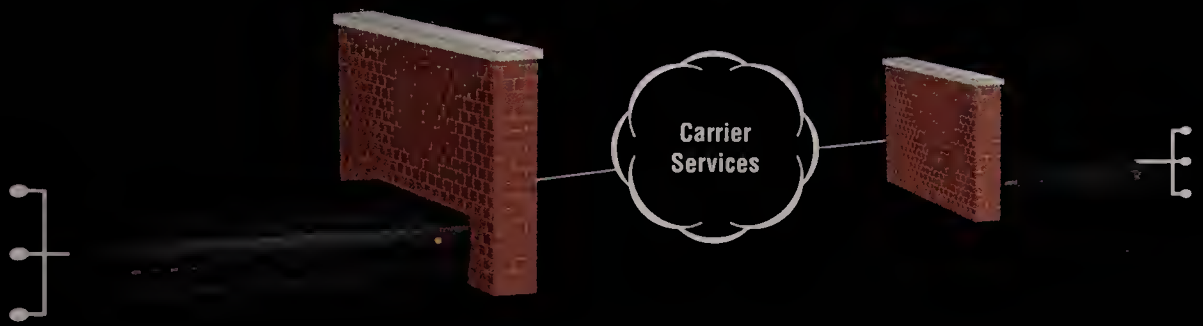

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Using 360-degree surveys and other gap analysis tools can promote better service from a company's own support departments

BY LAWRENCE SERVEN

The quest for quality has driven many companies to strive for better understanding of their customers' needs and how they are (or aren't) fulfilling them. They want to discover the gaps that exist between the company's own perception of service and that of its customers. One of the most successful gap analysis tools is the "360-degree evaluation." Named for the comprehensive perspective of its analysis, the 360-degree evaluation when applied externally uses a methodology with which an IS department or function is judged by *both* its staff and its customers.

Can the 360-degree survey and other gap analysis tools be applied internally to promote better service from a company's own support departments? The answer is an unmitigated yes, and proactive service organizations like IS should take the lead and drive the initiative from within. Given the trend towards outsourcing, IS leaders should embrace this tool to determine whether they are meeting the needs of their internal clients—if not, an outside firm might be all too eager to do so.

Many IS departments find the 360-degree evaluation an awakening, as they discover that their view of themselves is not necessarily shared by their clients, peers or superiors. A department's perceived strengths might be weaknesses in the eyes of others. What IS thinks its customers find important may not match what customers actually value. The survey can spotlight problem areas and assist an organization in assessing and setting priorities and then allocating resources. In other cases, the study can validate the scope and direction of IS services and foster a healthy respect for internal customers. Either way, a 360-degree survey can prevent an IS department from spending time and resources working around problems rather than correcting them.

For a 360-degree survey to be effective, an IS department must thoughtfully categorize themes for questions, clearly target goals and be willing to interpret results honestly. The survey should be widely distributed and should cover a number of IS performance attributes that can be grouped into a few meaningful categories. For example, in a study that was completed for a CIO of a Midwestern company, some 25 attributes were evaluated for importance and performance. The company arrived at these criteria by asking, "Where do we want to be?" and "What do we need to do to get there?" These attributes were then grouped into five thematic categories of systems: flexibility/accessibility, responsiveness, partnering, technology leadership and business solutions.

It's also critical that any survey be

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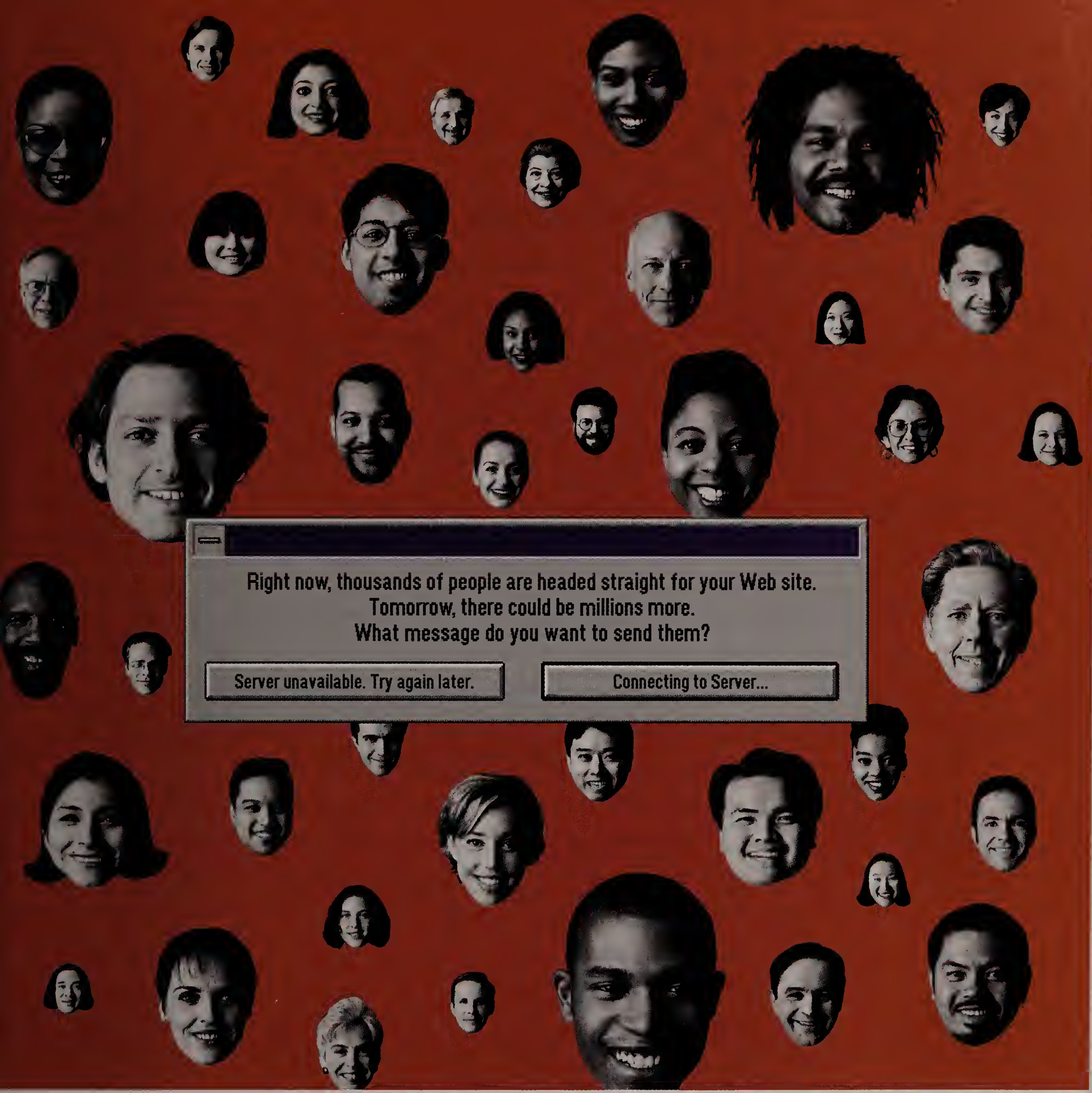

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Key Elements of an Effective Survey

. . . .

Creating assessment tools and using them is both art and science

- **Define what you want to measure.** Think about five or six themes tailored to the function. More time should be spent defining what is going to be measured than any on other consideration.
- **Develop specific attributes for grading.** Having defined what you want to measure, draw up the attributes that respondents will "grade" on importance and current performance. Consider incorporating about 25 attributes into the survey. The attribute total should be apportioned somewhat equally across each category.
- **Select the distribution list for respondents.** Those being surveyed should represent a cross-section of managers and subordinates. In some cases, it might be appropriate to include hourly employees as well.
- **Communicate.** Even before the surveys are sent out, take time to communicate to as many managers as possible the reasons for the survey, how it should be completed, etc. This will save time and reduce frustration.
- **Analyze results.** What attributes were rated as important? Were the most important attributes rated most highly on performance levels? Did the perceptions of the customers mesh with IS's own perceptions? Any surprises? What patterns emerge? The findings must be integrated with results from other gap analysis tools. *–L. Serven*

thoughtfully constructed. Remember that both technical IS employees and nontechnical clients will be completing the same survey. The listed attributes should be brief and clear to both constituencies and should cross-reference broader themes, such as "responsiveness." Attached questionnaires containing open-ended questions could be different for internal and external respondents. On the survey itself, each attribute, such as "minimizing downtime" or "responding quickly to an emergency request," is listed in the left-hand column; a second column for importance ratings and a third for performance appear to the right.

Including ratings for both importance and performance is key. For example, customer respondents might say that "prompt service" is important, but that performance in this attribute is currently "below standard." Such responses let IS management know not only what customers value but also where they see room for improvement. To the extent that customers find an attribute important but performance lacking, a statistically measurable gap exists.

The 360-degree survey also can pinpoint gaps between customers' perceptions of IS and the IS self-perception by showing the statistical discrepancies between responses from internal customers and those of the IS staff. That adds a richness and depth to the survey that can become the basis of a crucial reorientation for IS departments and a mandate for change.

To provide the most complete and credible picture, the findings of any survey should be compared with the results from other assessment tools. Often, there will be some clear areas where the findings overlap and reinforce each other. In the Midwestern company's IS department, survey results were evaluated along with attached questionnaire responses, interview results and visioning sessions with IS management. The following are a few examples of findings that came out of the assessment:

- Both IS employees and their internal customers agreed, in large measure, on what was important. In fact, IS and its customers shared the same top-five importance rankings, mostly related to system flexibility and accessibility, and the same bottom-three rankings. This was startling news for senior IS managers, who had assumed that their internal clients had different priorities than their IS staff. Much more common ground existed than was previously thought.
- Internal customers and IS employees differed, however, in their perceptions of performance levels. The partnering performance, for example, was far below standard, according to IS customers. Taken in concert with the other gap analysis tools, a picture emerged of a general belief that IS should be closer to the business.
- Although IS gave itself overall high marks for technology, interviews and questionnaire responses revealed that the staff thought they should strive for an even higher performance ranking in that area. They felt encumbered by legacy systems, and that brought down the performance ranking. That observation underscores the importance of incorporating a holistic approach to gap analysis, integrating all that's learned from interviews, visioning sessions, questionnaires and, of course, the survey itself.

A journey of a thousand miles begins with a single step. One might add that before that first step is taken, the journey's end must be determined. That's what an assessment is ultimately about. For the Midwestern company profiled here, that ultimately meant replacing legacy systems with cutting-edge technology to provide greater flexibility and accessibility of data, reorganizing around the need to get closer to the business and, perhaps most important, rededicating IS to serving its clients.

Lawrence Serven is a senior consultant with Deloitte & Touche Management Consulting Group based in Stamford, Conn. He can be reached via e-mail at lserven@dttus.com *or by calling 203 351-4764.*

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Gartner View: Get the Picture?

A Gartner Group study of leading users brings videoconferencing best practices into focus

BY AL LILL

Group videoconferencing is widely accepted as a useful business tool, and the next wave—desktop videoconferencing—is now hitting the marketplace with all the hype that vendors can muster. In Gartner Group Inc.'s view, technology is, in fact, beginning to catch up with the hype. We anticipate that unit shipments in the real-time collaboration market (this encompasses both traditional and desktop videoconferencing as well as data conferencing, which lets users view the same screen and work on the same document in real-time) will grow exponentially, achieving an average annual growth rate of more than 70 percent over the next three years.

Gartner Group recently conducted interviews with managers from multiple industries who are responsible for some of the largest, best-managed videoconferencing networks in the world. The information gathered from these leading-edge users can help increase success rates at all levels of videoconferencing deployment, from the planning phase to maintenance of mature implementations.

Goals and Advantages

Executives responsible for videoconferencing universally state the same two objectives for their applications: travel reduction and competitive advantage. Many executives say that videoconferencing results in more-productive meetings and the ability to attend multiple strategic meetings in far-flung locations within a short time span. The CEO of a huge multinational corporation sums up his view of the advantages of videoconferencing by saying, “It is the only way I can arrive in my office in New York at 8 a.m., participate in a European operations review meeting in London at 9 a.m., attend a key session of a sales managers' meeting in Chicago at 11 a.m., get a presentation from the president of our South American operations in Buenos Aires at 1:30 p.m., sit in on an important strategic planning meeting at our Los Angeles-based subsidiary at 4 p.m. and be home with my family by 8 p.m.”

Videoconferencing Best Practices

- Focus on saving time and increasing efficiency, not on travel-cost savings.
- Stick with a single-vendor strategy through 1996.
- Deploy H.320-compliant systems now and prepare for T.120-compliant systems by the end of 1996.
- Be prepared for administration problems when installing multipoint control units, and be ready to add staff to help.
- Prepare to exploit hybrid private and public networks.
- Assume that 128Kbps will be the dominant bandwidth throughout most of the world until it is superseded by 384Kbps in 1998.

Aside from enabling executives to virtually travel the globe in seconds, videoconferencing also helps organizations reduce time to market, accelerate product cycles and improve training. Many companies are also using videoconferencing to enhance communication with external business partners. Although only 10 to 15 percent of all videoconferencing traffic flowed between enterprises in 1995, Gartner Group expects that number to increase to 20 to 25 percent by the end of 1996. Major enterprises are making large-volume, blanket purchase agreements and then allowing suppliers and business partners to take advantage of pricing discounts. Some even have policies that force important suppliers to support videoconferencing.

The largest, most aggressive users of videoconferencing do not try to justify the capital costs of their installations based on hard monetary savings; instead, they focus mainly on saving time and other benefits. In the area of recruiting, however, videoconferencing provides significant, quantifiable benefits. Videoconferencing is highly effective for conducting initial interviews of candidates, especially for multinational corporations. For example, a candidate for a position in Europe can, through a videoconference link, sit in a company's European headquarters in Brussels and be interviewed by U.S. staff in San Francisco. Enterprises claim that videoconferencing not only saves money but enables them to hire more-qualified candidates.

Physical Units

Videoconferencing systems are currently segmented into boardroom, fixed high-end and roll-about units (see “Defining Videoconferencing Systems,” Page 40). A typical configuration has one or two fixed sites for major corporate loca-

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tions and roll-about units in other locations (more than 85 percent of all installed units fall into the roll-about category). When asked if significant configuration changes were expected, all the managers interviewed said that if $5,000 to $7,000 roll-about systems, which are scheduled to debut by early 1997, offer comparable performance to and require less physical space than today's $20,000 medium roll-about systems, they will rapidly deploy multiple units of those videoconferencing systems within their larger facilities.

In 1996, worldwide unit shipments will be two and one-half to three times what they were in 1995, with roll-about systems accounting for more than 90 percent of this growth, according to Gartner Group projections. However, market definitions of fixed and roll-about systems will be meaningless by the end of 1996, when new categories and definitions—such as set-top, desktop, portable, fixed high-end and fixed low-end—will be required to cover the plethora of new products about to hit the market. Companies should weigh business needs when deciding whether to delay videoconferencing investments until these products appear. If payback can be achieved in a few months, Gartner Group recommends forging ahead now.

> **The need to rely on service providers to link participants in different locations leaves many executives understandably worried about security. In one case, a service provider setting up a high-level strategy meeting caused a moment of panic when it switched into an incorrect site at *another* company.**

Applications

The managers we interviewed, all of whom had sophisticated deployments, identified key application categories and their success factors:

- **Ad hoc or crisis use.** To be effective on an ad hoc basis or during crises, a videoconferencing system must have high availability and reliability. It must also offer additional audio-bridging capabilities.
- **Management.** Using videoconferencing effectively for management depends on the ability to support existing handouts and graphs, ease of use and audio quality (minimal delay time, high fidelity and full duplex, or the ability to transmit and receive simultaneously). Video quality turns out to be much less important.
- **Engineering.** Managers who rated engineering as very important considered document and screen-sharing—or data conferencing—their top requirement. All said that desktop videoconferencing using installed workstations will be more effective in supporting engineering than group videoconferencing systems.
- **Sales and marketing.** Managers who rated this category as very important insisted that they are not actually selling via videoconferencing but supporting complex sales. Audio quality again emerged as the number-one requirement.
- **Recruiting.** Key success factors are minimal audio delay and high-quality video.
- **Distance learning.** Due to the acoustical challenges of use in large auditoriums, audio was also the top concern in this category. It was followed closely by simplicity in bringing up classroom materials with electronic annotation.

Hurdles

There are a number of hurdles to effective videoconferencing deployment, and scheduling tops the list. The managers surveyed unanimously agreed that scheduling multipoint videoconferences—those involving participants at more than two locations—is the most difficult hurdle. Many organizations lack company-wide access to the electronic scheduling system; in other cases, office politics in room scheduling are as much to blame for problems as the equipment. In addition to coordinating conference participants' schedules, companies also must arrange for telecom service providers to do the necessary switching and bridging at the appropriate time.

Naturally, videoconferencing is only as reliable as the network on which it takes place, and more than half the managers surveyed expressed disappointment with network service providers. Their complaints focused on poor availability during a crisis and security concerns. The need to rely on service providers to link participants in different locations leaves many executives understandably worried about security. In one case, a service provider setting up a high-level strategy meeting caused a moment of panic when it switched into an incorrect site at *another* company.

A significant emerging trend—moving to very small (three- to four-port) multipoint control units that are totally integrated and embedded with group systems—will alleviate many of those issues. Such units, which allow companies to set up their own conferences among three or more locations, simplify internal scheduling and eliminate the inherent risks of depending on a third-party provider to set up—and perhaps monitor the quality of—the connections.

Standard Approaches

Almost 80 percent of worldwide videoconferencing systems run at bandwidths of 384Kbps or less. When asked about future plans, all managers interviewed stated they are running at 128Kbps and would switch to 384Kbps for the majority of their systems in the next two years. That upward trend is typical of the group videoconferencing market as a whole.

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H.320 specifications, a family of videoconferencing standards that enable dissimilar videoconferencing systems on switched digital circuits, such as Integrated Services Digital Network, to communicate with one another. In addition, a majority will support the T.120 series of specifications for multipoint, real-time data conferencing across a wide variety of systems and communications links. T.120 has strong support from Intel Corp. and Microsoft Corp. In the future, more and more new units are expected to support both standards.

North American-based multinational enterprises use the Data Encryption Standard. However, problems arise with transnational communications. Some managers petitioned the U.S. State Department and received clearance to use the Data Encryption Standard for their Western European operations. A number of enterprises use encryption systems separate from videoconferencing. Many do not encrypt their transnational sessions at all. In fact, only 5 percent of all transoceanic communications use encryption. The remaining 95 percent are disasters waiting to happen. When the first security breaches are publicized, encryption use will increase dramatically.

Defining Videoconferencing Systems

Boardroom videoconferencing systems feature advanced cameras and monitors permanently installed in a conference room. Because they provide the highest-quality audio and video, they are also the most expensive videoconferencing systems. A typical installation can cost from $70,000 to $100,000—or more—per location.

Fixed high-end systems, which are used for specialized applications such as distance learning and high-end telemedicine, also require dedicated facilities but offer lower-quality audio and visual capabilities and range in price from $50,000 to $70,000.

Roll-about videoconferencing systems are self-contained units that hold codecs (compression-decompression algorithms), monitors and cameras. These units, which typically weigh more than 100 pounds, do not require dedicated facilities, and each can support approximately five people in one conference. Roll-about systems provide bandwidth of 112 to 384Kbps and range in price from $20,000 to $40,000. In coming years, the technological "guts" of roll-about systems will essentially become the same as those found in desktop videoconferencing systems.

Desktop videoconferencing systems house their electronics on one or two circuit boards, which reside inside a PC or under a desk. A separate camera for each system typically sits on top of the computer monitor. Separate audio channels and telephone lines are used for audio support. These systems support one or two people each, provide bandwidth of 112 to 768Kbps and range in price from $1,000 to $15,000. During the next three years, these systems will improve dramatically in price and performance, and $100 add-ons for good-quality systems will appear by the end of 1998. (For more on desktop videoconferencing, see "Intranet Telephony," *CIO*, Sept. 15, 1996.)

–A. Lill

Vendors

As for plans to mix different vendors' equipment, there was consensus not to do so until 1997, when, most managers believe, H.320 specifications will be robust. Enterprises should assume single-vendor deployment of videoconferencing systems through 1996; by 1997, however, H.320 specifications will have matured sufficiently for enterprises to mix and match vendor equipment.

Peripherals

Since all of the managers interviewed have sophisticated videoconferencing deployments, they reported heavy use of peripherals, which include document cameras, scanners and integrated fax systems.

T.120-based ancillary equipment began to hit the market in mid-1996, so peripheral-device support is now the biggest factor differentiating group videoconferencing products. Instead of needing separate products to enable videoconferencing and data conferencing, companies will be able to choose one that does both. Enterprises should select only vendors with clear T.120 implementation plans.

Infrastructure

All of the enterprises surveyed rely on a combination of public and private networks. Future plans include using public networks worldwide, which is consistent with overall market trends.

A majority of managers interviewed say they expect satellite videoconferencing to increase. They are preparing for full digital up-and-down links, primarily for economic reasons. Many enterprises plan to implement both video and high-speed data communications support via digital satellite by the end of 1997.

Videoconferencing use is enabling many enterprises to rack up impressive success stories, contributing to greatly improved time to market and faster, more effective decision making by top executives. The new generation of economical videoconferencing systems will enable many companies to justify establishing videoconferencing links with small branches and offices. Enterprises that have previously rejected or limited purchases of videoconferencing systems based on high capital costs should reevaluate such systems.

Al Lill, vice president of advanced computing environments and research director at Gartner Group Inc., can be reached at 203 316-1111.

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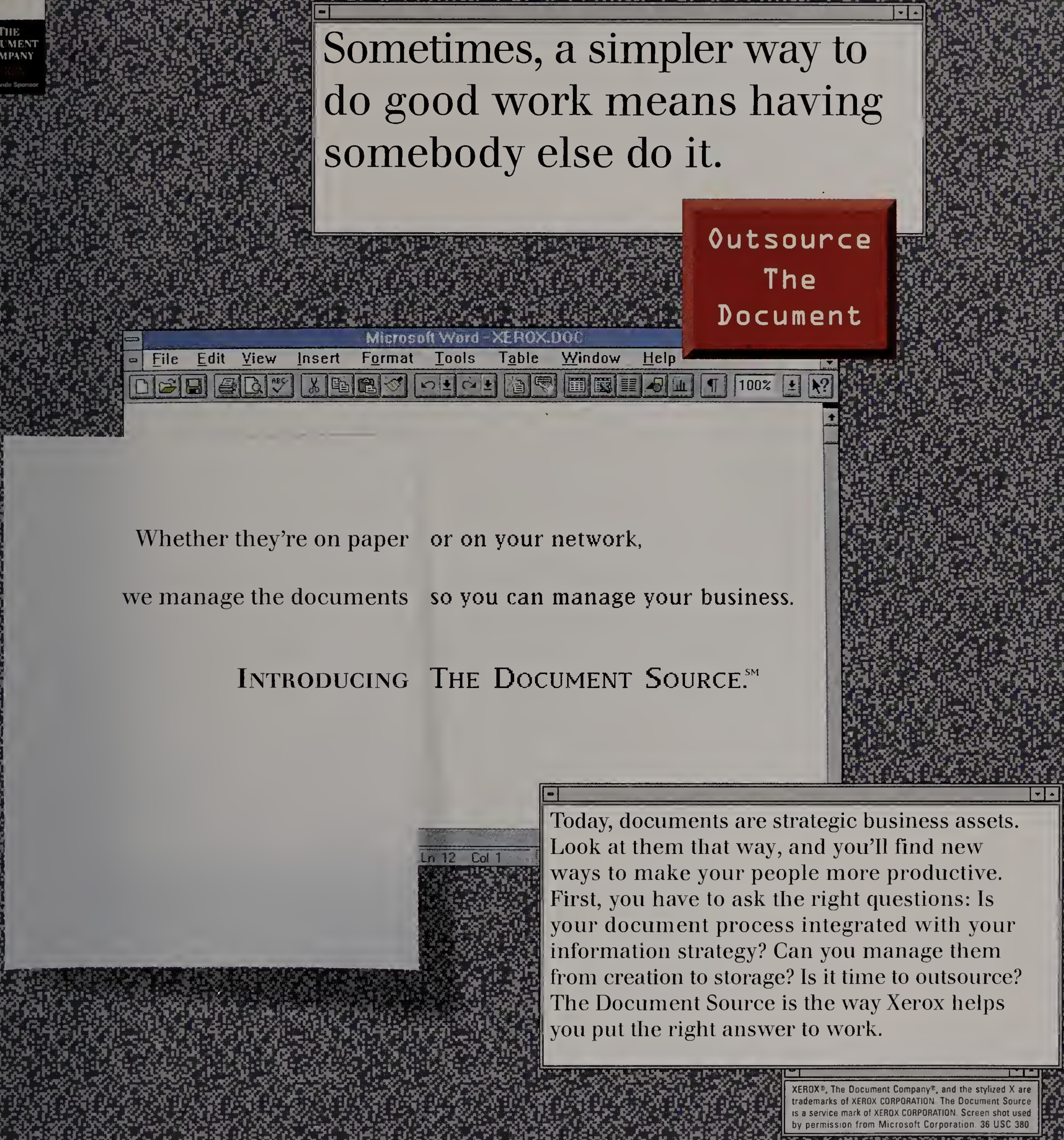
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SHIPPING OUT

Sending software development projects to another continent isn't without risks. But if the project is right—and properly managed—going offshore can be just the ticket for CIOs seeking high-quality, low-cost work.

BY LYNDA RADOSEVICH

THE GLOBAL ENTERPRISE

Edward Remington prefers to keep software projects in house. That way, Remington, assistant vice president of information systems at Circuit City Stores Inc. in Richmond, Va., ensures that the experience gained on new projects will be there to help future efforts go smoothly.

But preference is one thing, practice quite another. And in reality, the manpower just isn't there to complete every good project on Circuit City's drawing boards. So when it came time to update an AS/400-based receivables system earlier this year, Remington hired outsider Mastech Corp. of Pittsburgh to do the development. While there's nothing uncommon about contracting development work, this arrangement had a twist. Instead of the programmers tapping out code in a suburban office park in Pittsburgh, they're writing it in a suburban office park in Bangalore, India—a detail that likely halved the project's price tag to $75,000.

With savings like that, why think in provincial terms?

"When you think about it, it's not any different than allowing people to work at home," says Remington. "IS professionals tend to need minimal supervision. With a lot of the work they're doing on the PC, they can be sitting anywhere, whether they're outside your door, in their homes or offshore—as long as you have somebody who can manage discussions and specs, and you have good test systems and quality reviews."

While most technology chiefs find offshore outsourcing isn't quite *that* easy, Remington isn't alone in his global open-mindedness. Managing work being done halfway around the globe isn't without risks; the ability to respond quickly to changing business needs, security concerns, cultural differences and infrastructure challenges are among the issues that must be considered. But the lure of inexpensive, plentiful and experienced programmers increasingly is drawing companies into outsourcing arrangements in which much of the programming occurs overseas. Contract programming is flourishing in Brazil, China, India, Ireland, Israel, Mexico, the Philippines and Russia, among other countries, but India—with its rich talent pool, English-speaking citizenry and low labor costs—is the widely acknowledged leader.

> *"International outsourcing is one of the most rapidly growing sub-industries of the entire software domain."*
>
> *–Capers Jones*

Statistics on the overall market aren't available, but observers see plentiful evidence of expansion. Outsourcers with operations in India are reporting 45 percent to 60 percent annual growth. Gartner Group Inc. predicts that within two years, 40 percent of its clients will spend up to two-fifths of their legacy budgets on offshore outsourcing. "International outsourcing is one of the most rapidly growing sub-industries of the entire software domain," says Capers Jones, chairman of Software Productivity Research Inc., a consulting and research firm in Burlington, Mass.

What's fueling the fire is the basic law of supply and demand. India and other countries have invested heavily in technical education and telecommunications improvements. Now there's a ready supply of bright people available at low cost, and the infrastructure to support them is maturing. On the home front, IS departments have huge backlogs for application development and conversions, and the burden of legacy maintenance hasn't disappeared. Also, companies are bracing for the labor-intensive job of preparing systems to handle date fields in the year 2000 (see the upcoming article "Will Your Systems Survive the Year 2000?" *CIO*, Sept. 15, 1996). At the same time, there's a shortage of domestic programmers. Because of these factors, offshore outsourcing can be up to 50 percent cheaper than domestic development, experts say, and the quality of work can be quite good.

Outsourcing veterans, however, warn CIOs not to become so enchanted by savings that they overlook offshore risks. In a recent study, Howard A. Rubin, president of Rubin Systems Inc., a consulting company in Pound Ridge, N.Y., found that companies require four basic prerequisites—expertise in a technical language, proficiency in the company's native spoken language, a large staff and a good telecommunications setup—before they'll consider hiring an offshore partner; then they make a judgment call based on price. But price doesn't indicate quality, value or the appropriateness of sending a project overseas. For instance, sheer physical distance renders it risky to go offshore with systems work that requires day-to-day interaction be-

The International Factor

Things to consider when deciding whether to pursue offshore outsourcing

- The level of expertise of the candidate partners in the kinds of software your company uses
- The availability of satellite or reliable broadband communications between your sites and the outsourcer's location
- The local copyright, patent and intellectual property protection within the country where the outsourcing vendor is located
- The probability of political upheavals or factors that might interfere with transnational information flow
- The basic stability and economic soundness of the outsourcing vendor and what might occur should the vendor encounter a severe financial downturn
- Appropriateness of project size (one-time projects under $50,000 may not be worth the overhead)
- Firmness of business specifications (projects with rapidly changing business requirements generally are not appropriate for offshore work)
- Your company's level of experience in managing outsourcing contracts with local service providers

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tween cross-functional development and business teams. "When you take a look at offshore outsourcing, you have to look at project characteristics," Rubin says.

The most appropriate candidates for offshore work, experts say, are large-scale, well-defined projects that require several worker years' worth of coding. Legacy systems maintenance, client/server development, year 2000 date-field conversion and porting systems software to new environments are examples. Costs range widely, but Curtis G. Terwilliger, a vice president of engineering at outsourcer HCL America Inc., in Sunnyvale, Calif., says average project expenses are around $200,000, and a single client typically contracts for several projects totaling about $1 million. Some companies outsource smaller jobs, but as contract size shrinks, the overhead grows and savings begin to evaporate. "If you go under $50,000, economically it won't make sense," he says.

MIKE STEVENS: *Offshore outsourcing enabled CCD to staff up quickly with qualified programmers to handle a large development project.*

PHOTO BY TONY SCHANUEL

If the project is right, the case for overseas outsourcing can be compelling. Going abroad can take the heat off technology chiefs who are striving to staff up quickly for large, demanding projects. Mike Stevens, director of information technologies for Consolidated Communications Directories (CCD) Inc. in Effingham, Ill., knows the strain of searching for talented programmers in a vacuum. Stevens is in charge of rewriting all legacy applications (production, sales, accounting, customer service, etc.) and porting them to a client/server architecture for CCD, which publishes phone directories in 38 states. He's developing the applications using Oracle Corp. databases and Oracle's CASE development tools. But "something seems to be sucking the Oracle people up like a black hole, especially in this part of the country," he says.

> *The most appropriate candidates for offshore work, experts say, are large-scale, well-defined projects that require several worker years' worth of coding.*

To fill the void, Stevens turned to Syntel Inc., a Troy, Mich.-based outsourcer with development operations in India. Anticipating just such a need, Syntel had a ready supply of Oracle programmers. Now Stevens has as many as 30 developers hard at work in Bombay and 10 in Illinois. He anticipates the 30-worker-year, multimillion-dollar project will be completed in November 1996, less than 18 months after starting. Going offshore was the only way to get enough skilled people on board with short notice, he says.

Other shops find offshore outsourcing can shift development speed into warp drive. The time zone difference allows companies to run 16 to 24 hours of programming per day without paying overtime. When

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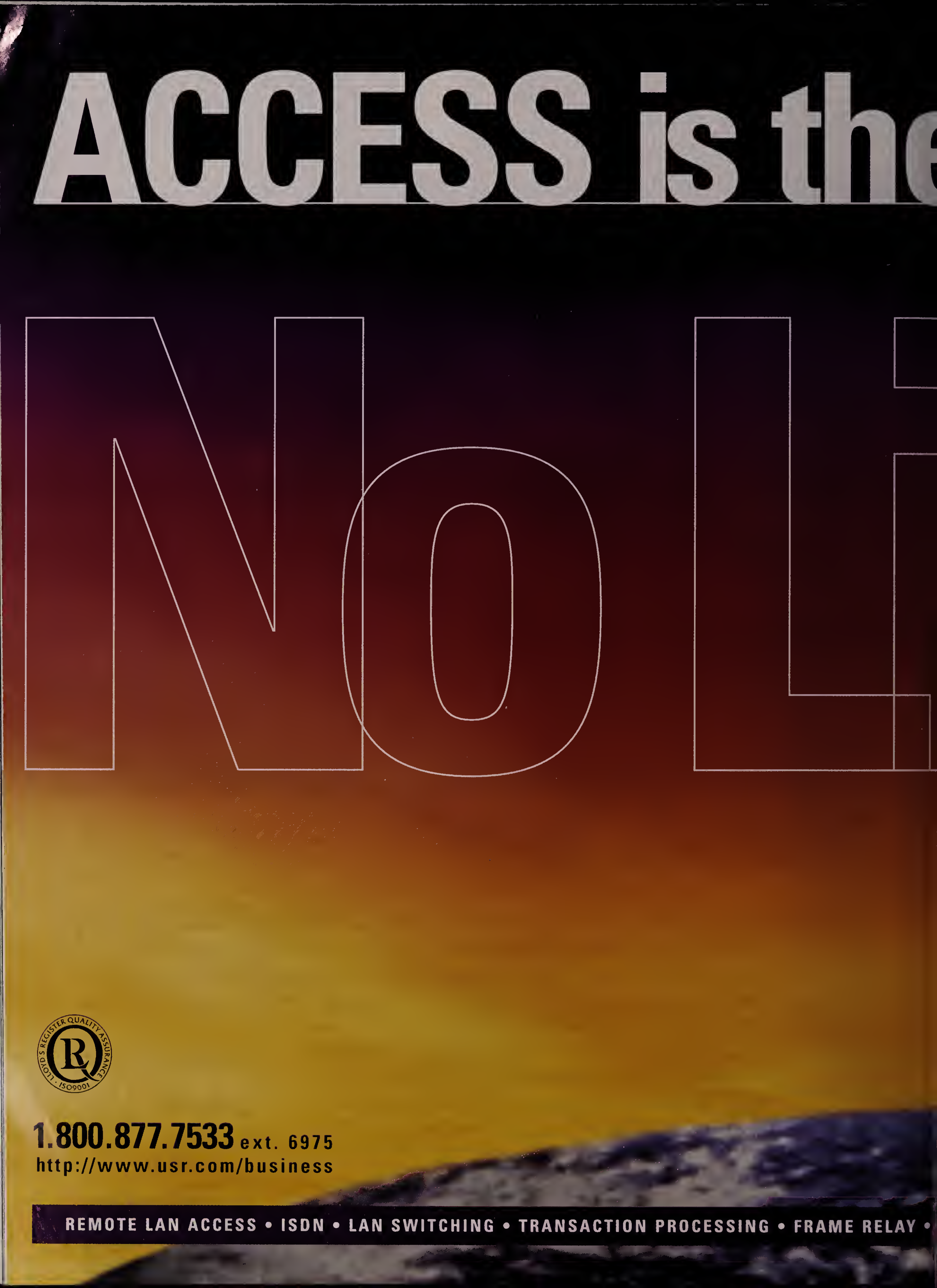

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the offshore workers finish their shifts, they hand off code to U.S.-based workers who are just pouring milk on their first bowls of Cap'n Crunch.

For the state of New Mexico, such round-the-clock productivity turned a setback into a success. In 1992, the state was $5 million and four years into developing a $12.3 million oil and gas tax system called Ongard when the original contractor went belly-up. The state rebid the project and awarded it to Syntel for $7.9 million.

Five senior analysts from India came in for a six-month design phase; then 50 or so programmers in Bombay began reworking the existing code and developing new code. The Indian programmers worked in two shifts and wrote the software directly on the state's computer, using a satellite link from Bombay to Syntel's Troy office and a dedicated 56kbps phone line to the state's mainframe in Santa Fe. In the morning, the state's quality assurance people picked up where the Indian programmers left off. "It was like running a 24-hour shop," says Harry Beck, Ongard project manager for the state of New Mexico.

WORDS OF ADVICE

IS managers who have sent work overseas recommend the following to help assure a successful offshore outsourcing experience:

- **A formal version-control process,** coordinated through a quality assurance person
- **A dictionary of terms** so that there's common understanding of technical jargon
- **A vendor-supplied project manager** at the client site to overcome cultural barriers and facilitate communication with offshore programmers
- **A network manager** at the vendor site who coordinates the logistics of using several communications providers across the continents
- **Advance agreement on structure and content of documentation** to avoid manuals that explain how the system was built, not how to maintain it

Although speed and ready availability of resources are compelling reasons to ship projects overseas, the most popular benefit of offshore outsourcing, of course, is its low cost. When faced with paying half as much for overall development on multimillion-dollar projects, the choice can be crystal clear.

Talat Sadiq has plenty of experience in saving money offshore. Prior to becoming a vice president at Sun Microsystems Inc. in Mountain View, Calif., he governed global trading systems for Citibank's investment bank division based in London. To develop these systems for Citibank, Sadiq subcontracted the work to Citibank's own subsidiary, Cosl, in India. "I was always looking for ways to get more for less out of the IT budget," he says. "[Indian programmers] are more efficient and less expensive, and there's a tremendous talent pool in India." So when Sun needed a new sales-force commission system built quickly, Sadiq, then the director of Sun's worldwide trade systems, suggested offshore outsourcing. Sun contracted the system to HCL America for roughly $500,000 with a majority of the coding to be completed by Indian programmers. If Sun had brought in HCL at its standard U.S. rate, the project would have cost $1 million; according to some, if the company had used a Big Six accounting firm, it would have cost closer to $2 million. Sadiq says financially savvy decisions like this one helped him get promoted to vice president quickly.

HARRY BECK: *With programmers in Bombay tag-teaming developers in Santa Fe, offshore outsourcing "was like running a 24-hour shop."*

PHOTO BY POLLY BROWN

But offshore outsourcing doesn't always pay off. A software development company in Cambridge, Mass., went to India in search of cheap labor but instead

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found a basketful of headaches. Customs officials charged huge tariffs when the company tried to ship the necessary development software and manuals, and the programmers weren't nearly as experienced as they claimed to be. The code that came back was substandard, and the company had to send a representative to India for multiple, month-long stints to work with the Indian programmers. "It was really, really frustrating for us," says the company's former director of software development, who prefers that he and his previous company remain anonymous. Although the director was unhappy with the situation, the firm's CEO was enthralled enough with the savings that he insisted on continuing the arrangement, prompting the software director to jump to another company, he says.

Less tangible are the political issues of offshore outsourcing. U.S. workers, especially those who have been laid off, are touchy about jobs being handed to low-wage workers overseas. "If you're a department being outsourced, and suddenly you have to deal with foreign nationals, you have a lot of frustrated people," says John R. Danieli, president of The Computer Merchant Ltd. in Norwell, Mass., a software services consultancy.

Also, cultural differences can cause tense moments. Indian programmers, for instance, are known for keeping quiet, even when they notice problems, says Shekar Sivasubramanian, a vice president at Mastech. And subtle differences in gestures can cause confusion. In the United States, shaking your head from side to side means no. In the south of India, it means yes. Terwilliger discovered this anomaly when he first joined HCL. He once asked programmers whether they had finished a TCP/IP port. They shook their heads, which he took to mean no. "My blood pressure went up 20 points," he says. After 10 minutes of befuddlement, he figured it out. "One has to learn these things," he says with resignation.

TALAT SADIQ: *"Indian programmers are more efficient and less expensive, and there's a tremendous talent pool in India."*

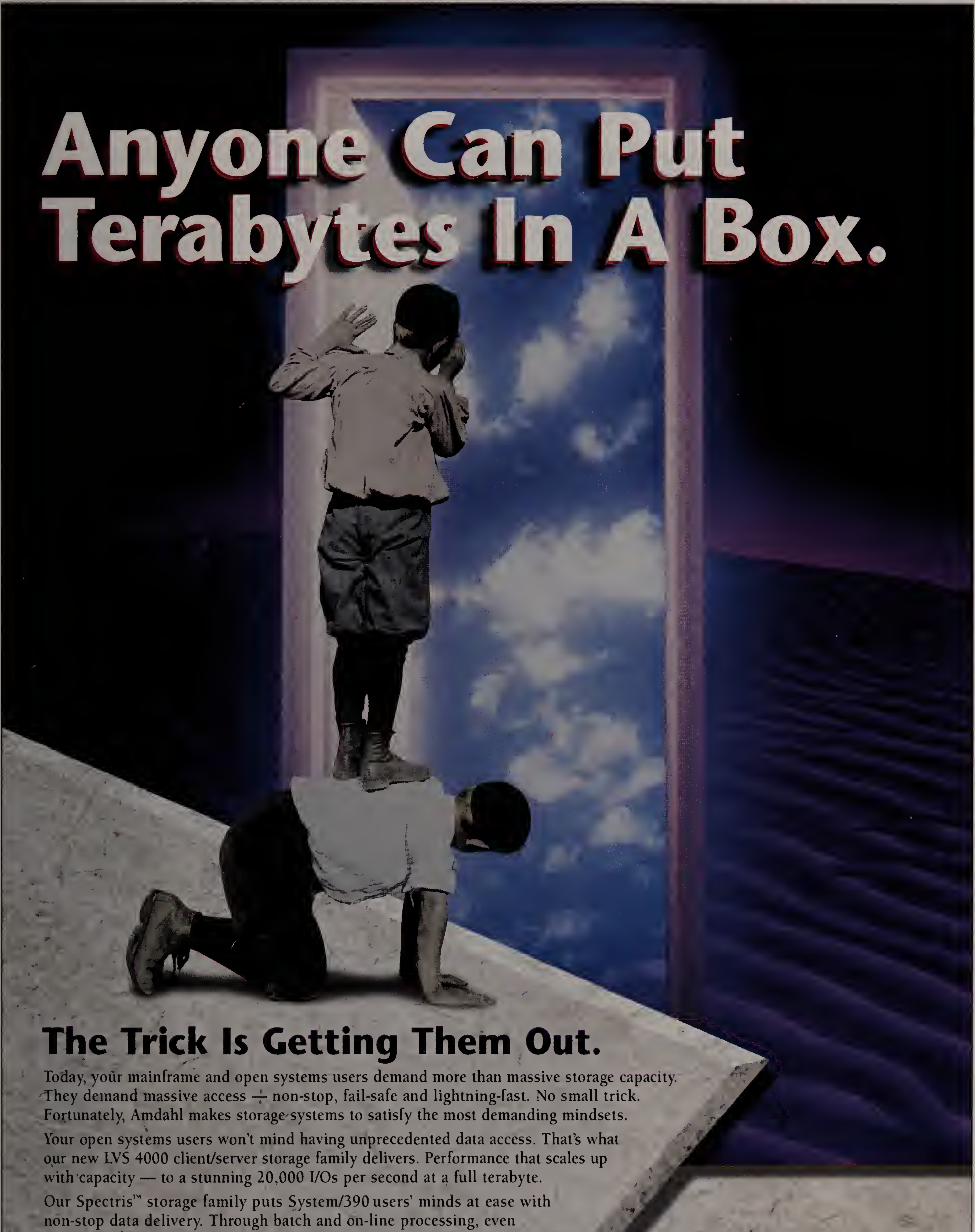
PHOTO BY CINDY CHARLES

Another risk is falling into the out-of-sight, out-of-mind trap, in which IS executives take a hands-off approach to project management. "A lot of people think that by going to an external service provider, they can outsource responsibility and accountability. You cannot, in any scenario, outsource responsibility and accountability," says Kevin Schick, director of year 2000 strategies at Gartner Group in Stamford, Conn.

Less than half of Fortune 1000 companies have the managerial and technical foundations to take advantage of offshore outsourcing today.

When trouble arises, it's often because companies aren't set up properly to handle offshore arrangements. Schick estimates that less than half of Fortune 1000 companies have the managerial and technical foundations to take advantage of offshore outsourcing today. CIOs must ask themselves whether there is precedence in the organization for using external services, let alone external services that are going to be thousands of miles away. They also must ask whether the organization has the telecommunications capability to move data and application source code between an offshore site and headquarters. If the answer to either question is no, going offshore can be a bad bet.

"A lot of companies today don't do [software development] well in-house. To add to that the complications of an external service provider and then further complicate that with offshore ser-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Offshore Outsourcing by the Numbers

	Software Professionals*	Average Salary
Brazil	**665,663**	**$48,000**
China	**1.3 million**	**$7,150**
Russia	**1.1 million**	**$12,000**
India	**947,100**	**$8,200**
United States	**2.46 million**	**$55,000**

* *Including engineers, quality assurance specialists, testers, technical writers and software managers.*

SOURCE: SOFTWARE PRODUCTIVITY RESEARCH INC., 1996

vices is a formula for failure," Schick says. However, with good project management practices, technology chiefs find they can overcome the risks and make the benefits of offshore outsourcing worthwhile.

Happy customers say choosing a partner that is based in the United States or has a very large field office here is a big help. That way, companies can work with a local representative who understands U.S. business practices and coordinates the offshore environment. To keep communications flowing, the outsourcer should run a satellite or fiber-optic link from its offshore facilities to the States and run a dedicated line to the client site. Other decision points include the size of the organization, experience in the types of projects being contracted and financial security. "If you pick a professional firm that has done this before and you have a good understanding of what you're trying to accomplish, your chances of failure are not that high," says Sadiq.

Also key is having good on-site managers from the outsourcing partner. The managers effectively insulate clients from the administrative and cultural issues of outsourcing. At first, New Mexico's Beck was concerned about the logistics of communications, but he says he had no problems. "Part of that was because their programming team leaders came over and participated during the design phase. They had a very good feel for our requirements, the users, the attitudes, the culture," he says.

Perhaps the biggest success factor is a methodological approach to offshore development. The state of New Mexico uses an online change management system developed by Syntel. When bugs or errors are detected in the system under development, quality assurance workers in the States enter the problem into an electronic form, and Indian programmers then pick up the forms from the work list. CCD follows an application development methodology based on Oracle's CASE method and modified when necessary. "CASE has helped tremendously in offshore [development] because it forces a rigor on you in the way you develop apps, and it's a good documentation tool as well," Stevens says.

SMOOTH SAILING

To keep offshore projects running smoothly, Shekar Sivasubramanian, a vice president at Mastech Corp. in Pittsburgh, recommends that clients have one project manager or senior technical lead on-site for every seven to 10 programmers off-site. On Mastech projects, the blended billing rate of such a ratio comes out to about $25 per programmer per hour.

To hedge their bets, many companies splash around with small projects first, then dive in deeper once they've seen positive results. Circuit City's Remington sampled offshore outsourcing with a $75,000 receivables system that "wasn't of the utmost priority," he says. The job entailed two managers on-site and four programmers in India. Mastech's offshore team delivered completed chunks of the project every two weeks so that Circuit City could measure progress. Once Mastech successfully completed the task, Circuit City contracted a beefier, $175,000 project to rework a transactional sales database using three people on-site and 15 people on the offshore team. Six months into the project, Remington reports that it's working very well.

For more facts and figures about offshore outsourcing, visit CIO's Web site at www.cio.com/CIO/090196_offshore.html.

After the project management ducks are in a row, experienced voices say the most important element to a successful offshore outsourcing relationship is the personal touch. The programmers are people with families, personalities and fascinating cultures, not cost-versus-productivity statistics. When the CIO takes a trip to the offshore facility, it can foster much better understanding and appreciation on both ends. After Stevens at CCD sent his senior managers to India, he went himself. The flights were long, and the movies got old after seeing the same ones on each leg of the journey, but "the purpose of trip was to meet the team, give it the personal touch," he says. "That was worth its weight in gold." CIO

Lynda Radosevich is a freelance writer based in Belmont, Mass. She can be reached at lradosev@interserv.com.

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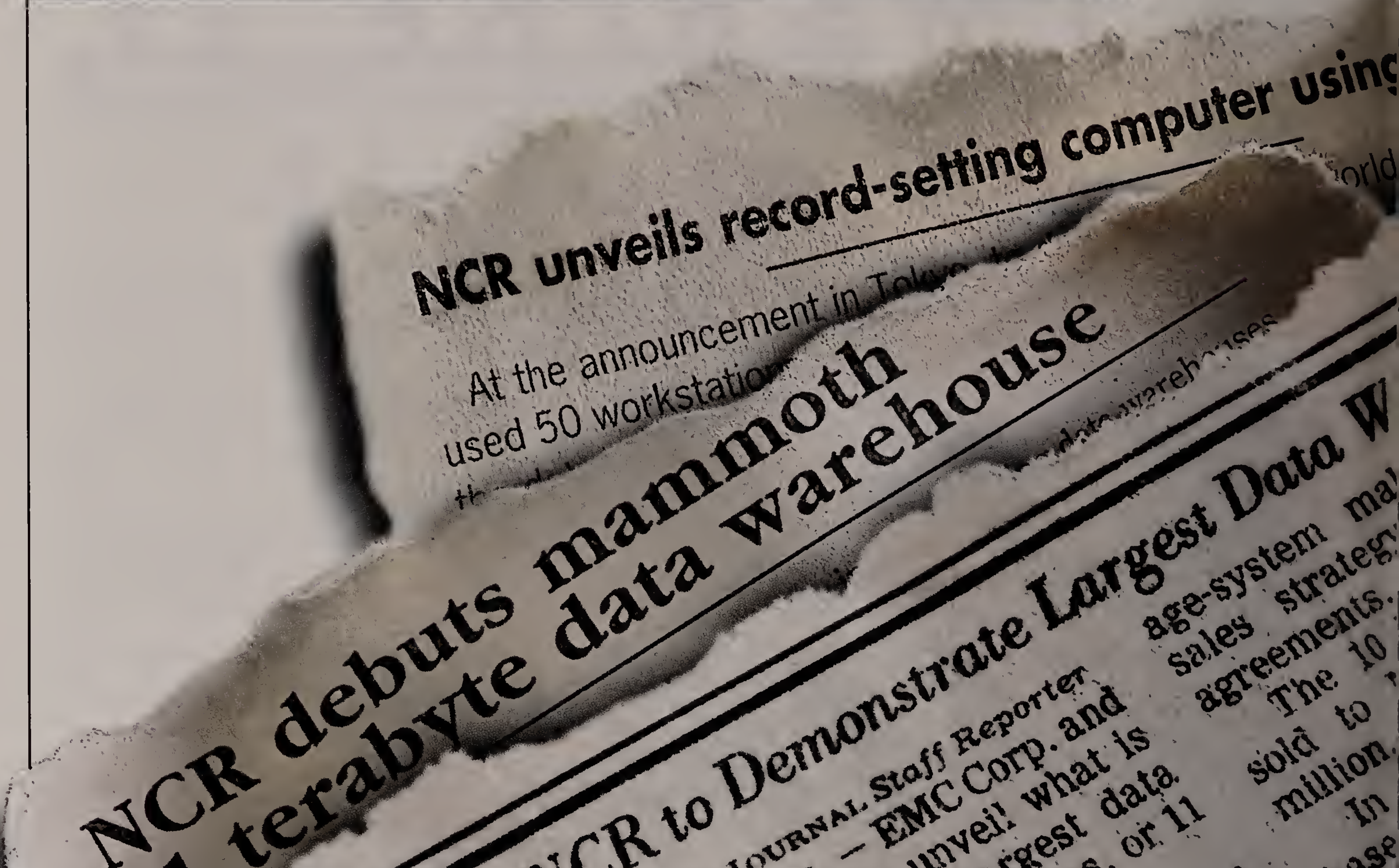

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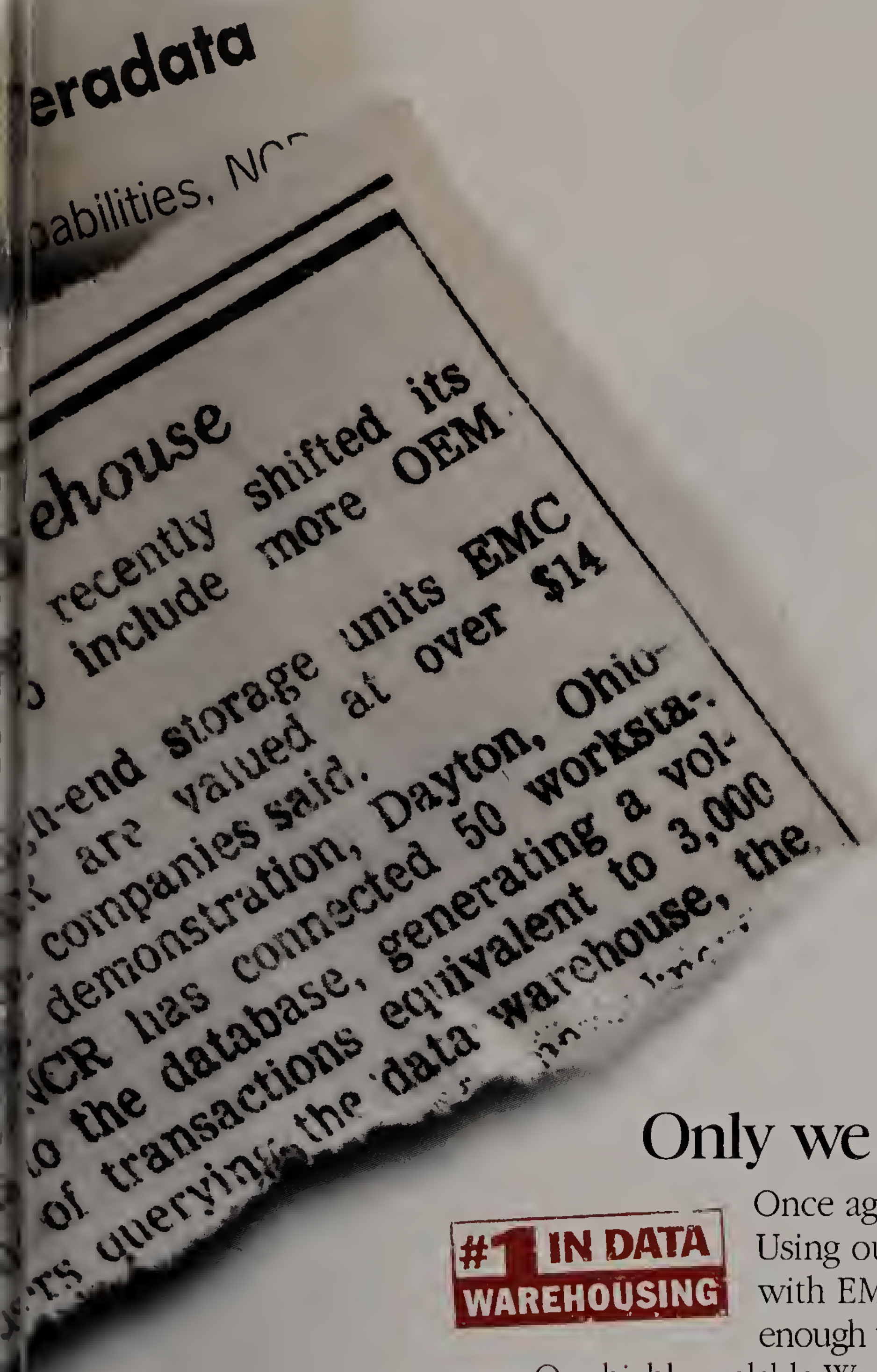

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Now that the hype, hoopla and hurrahs over client/server have quieted a bit, three organizations review the sometimes bumpy migration from mainframes

Triple Replay

BY PETER FABRIS

MOST CIOS, WEANED IN THE glass house mainframe environment, initially viewed the client/server platform with great skepticism. But in recent years, client/server has become the norm in many organizations. Have wary CIOs finally accepted the new platform? Does it truly meet organizations' productivity expectations? What about still-daunting challenges such as component compatibility, testing tools, adequate system management and hidden training and support costs?

It may sound like soap opera, but to answer these and other questions, *CIO* revisits three organizations that implemented client/server.

Viacom Inc.
Headquarters: *New York*
Diversified media conglomerate
Employees: *85,000*

AT THE TIME OF THEIR COMPANY'S profile in *CIO* (see "Pop Goes the Network," *CIO*, February 1993), IS executives at Viacom Inc. had an inkling that their migration to client/server, begun in 1991, would yield far-reaching results, though they never dreamed the new platform would have to adjust to so much growth so swiftly. Since the 1993 story, Viacom (a media conglomerate that already included MTV, VH-1, Nickelodeon, Showtime, The Movie Channel, cable television franchises and broadcast television stations) acquired Simon & Schuster Publishing Inc., Blockbuster Entertainment Group and Paramount Pictures. The acquisitions created sudden diversification beyond what IS could have anticipated when the migration began. The client/server platform made it easier for IS to support such sweeping change and enabled the company to take advantage of new business opportunities.

In response to the acquisitions, executives opted for a decentralized corporate structure, granting business units independence to devise their own strategies with the hope of making the company more agile. After an intensive architectural review of the company's IT assets and structure, IS executives chose to decentralize most technology services, too. "We found that we were in vastly different businesses," explains former senior vice president and CIO Henry Leingang. "You're not going to use the same systems at Blockbuster

EDWARD HOROWITZ: *At Viacom's fast-paced culture, old technologies are not tolerated for very long.*

and Paramount. There was limited opportunity for significant [IT] coordination." The end result: The IS brain trust concluded that it didn't make sense to continue with a centralized IS unit and a corporatewide CIO. Soon after, Leingang left the company in February 1996. Though he lost his job because of decentralization, even Leingang says it was the right move for IS. The benefits of decentralization—such as having IS personnel close to business units so that they can get to know the user community more intimately and make the most of flexible client/server technology—are fairly obvious; nevertheless, there are pitfalls. "The whole issue is more than just technology [implementation]," Leingang says. "That is relatively easy." More difficult is "the cultural shift—getting business units to take responsibility [for their systems]. Most people at Viacom haven't been through that. Frankly, Viacom is going to continue to struggle with that [change]," he says.

Despite that challenge, decentralization was necessary for technical and strategic reasons. It's not surprising that the company's widely different cultures would adjust differently to control of IT. The youthful, freewheeling, experimental environment at MTV is a stark contrast to the staid world of book publishing at Simon & Schuster, for example. Clearly, "we can't impose the MTV culture on Simon & Schuster and vice versa," says Edward D. Horowitz, senior vice president of technology at Viacom Inc. and chairman and CEO of Viacom Interactive Media. Viacom's creative, fast-paced culture "doesn't tolerate staying with the old technology for very long," he emphasizes. For some units, such as MTV, time to market is especially critical. In the past year, the division has launched MTV Asia and MTV Mandarin while maintaining VH-1 UK and VH-1 Germany. For IS to stay in sync with growing diversity, it has to work quickly and concentrate on small-scale projects, Horowitz says. Client/server is more conducive to a climate of rapid change than the

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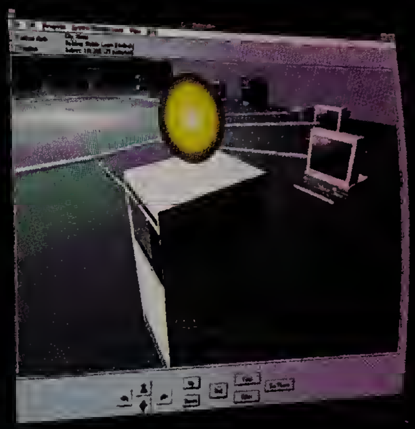

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TOM ESPELAND *and* **TOM MELLINA** *are dissatisfied with application development tools.*

PHOTO BY ERICA FREUDENSTEIN

mainframe environment. "On the mainframe, internal customers became disenchanted with the long time frame to develop applications," says Tom Mellina, vice president of information technology for Viacom.

After committing to client/server, Showtime's IS unit, under Jerry Cooper, Showtime's executive vice president of finance and operations, and Tom Espeland, senior vice president of information services and technology, built 28 applications over a two-year period. The applications yielded impressive productivity gains. In finance, for example, before the client/server financial system, month-end closings took from four hours to several days. Users had to pore over paper batch-data reports to accomplish their tasks on legacy systems. Today, closings are nearly automated; the process is completed in minutes. "A built-in capability called the Audit Detective does checks and balances for you," says Tom Hayden, senior vice president of business planning and analysis at Showtime. "We can now spend a lot more time figuring out what's going on with the business instead of chasing down information."

IS stumbled, however, when it underestimated the importance of end-user training for the sales staff, perhaps having been overwhelmed by a dozen new client/server applications in six months. "At first, we had very limited IS support in the field," Espeland says. A one-week training period for the sales force, some of whom had never used PCs, proved inadequate. "That was a mistake," Espeland admits. To remedy the situation, IS provided additional training and installed permanent on-site support. Espeland also established a user steering committee to give users a louder voice in system development. Users now influence development in joint meetings with IS. "We use a projector that casts actual computer screens on a [wall] screen," making changes based on user input instantly visible, Espeland says. "[This process] is real-time [applications] design." Such intimate user involvement "creates a level of buy-in you've never seen before."

The secret of success for IS at Showtime is simplicity, executives say. Espeland says he believes a two-tiered, fat client/lean server architecture increases the odds for success. "It's easy, and it works," he says. Three-tiered architectures, though they offer some advantages, are more difficult to design and build. (See "Thick and Thin of IT," Page 72.) Viacom's frequent network infrastructure upgrades also contribute to success at Showtime and other units by supporting the bandwidth demands of more sophisticated applications and additional employees, Mellina adds. However, the client/server platform does have technical shortcomings. For example, Mellina and Espeland say they are dissatisfied with application development tools, such as Powersoft Corp.'s PowerBuilder and the like. "Although [these tools] have come a long way in the last 18 months," Espeland says, "PowerBuilder is probably not where it needs to be."

The source of client/server's sometimes unreliable reputation can

VIACOM INC.

	Concern	Outcome
End-User Acceptance	Users might not adapt to client/server and GUIs.	Users unfamiliar with PCs were slow to adapt. IS initially underestimated support requirements.
Reliability/Scalability	Client/server would prove to be immature and unstable.	Two-tiered architecture works well; some development tools remain immature.
Impact on IS	Diverse business units with different IS needs would make leveraging technology across the units difficult.	With the exception of some networking technology, IS was decentralized because business units' needs were too different.

be traced to the desktop, Leingang says. The same PC models can vary depending on when they were built. "If they're manufactured in different weeks, they have different components." That creates incompatibility issues. Furthermore, the Windows operating system hasn't been reliable, though "[Microsoft Corp.'s Windows] 95 and [Windows] NT are more robust and stable," he says. The real Achilles' heel of desktop machines, however, is inadequate workstation troubleshooting tools, he says.

Despite horror stories about the hidden costs of client/server, "we've been pretty successful in estimating costs," Espeland says. Two exceptions to Viacom's success at estimating were the conversion of eight database platforms to one and the creation of adequate storage capacity; both exceeded budget estimates. Budget and technical shortcomings aside, the platform enables Viacom IS managers to support the company's fast-paced strategic maneuverings. For instance, in the first quarter of 1996, Showtime co-launched the Sundance art film channel. "We were able to quickly deliver an automatic [movie] scheduling system," Espeland says. Quick response is IS's most vital mission, and client/server allows it to deliver.

Putnam Investments
Headquarters: *Boston*
Money management firm
Employees: *3,200*

THESE ARE BOOM TIMES FOR Putnam Investments. Wall Street is awash in cash as aging baby boomers pump billions into retirement investments. As of May 31, 1996, the Boston financial services company managed more than $140 billion in assets for institutions and individuals, up from $107.6 billion in May 1995. But competition in the financial services industry remains fierce. "Our business is moving so fast that we [in IS] have to respond and deliver quickly," says CIO and Managing Director Gavan Taylor.

Client/server provides a flexible, scalable platform to meet that challenge in key areas such as customer service. "Today, people like to make one call and get all the answers to their questions immediately," Taylor says. A client/server system enables 400 customer service telephone representatives to respond quickly to account inquiries. "We used to have a lot of data at customer representatives' fingertips but on multiple systems," says J. Thomas Despres, managing director of the communication services division. "They had to log off one system and log on to another or toggle between screens." The new system provides much smoother navigation between systems and faster access to customer account information. The key to the success of that and other client/server systems at Putnam, according to Taylor, is the Nintendo-like ease of use afforded by GUIs. Despres agrees. "The new system has greatly reduced the training needs of my department," he says.

Client/server was a realm like a Wild West town, lacking technology laws.

Client/server reaped productivity benefits in other areas. In the past year, the global equity trading division experienced a 120 percent increase in gross dollars traded. Despite that huge jump, Brett C. Browchuk, managing director and chief of equity trading, has been able to maintain the same staffing, due to a "spectacular" increase in productivity from a new trading system. On a recent morning, Putnam's mutual fund traders placed an order to sell 165 stocks. The new system allowed one trader to place the orders in less than a minute. In contrast, several traders needed about a half-hour to accomplish the same task with the old system. The time savings comes from an automated feature that prioritizes trades according to a number of factors including volume and whether stocks are listed or traded over the counter, Browchuk says.

Taylor anticipated that the process improvements would come to the fore after IS began the conversion in 1993. Nonetheless, he harbored reservations. Vendor hype about how the technology could practically reengineer companies by itself, for instance, seemed drastically overblown. "Some vendors made some outrageous claims," he

GAVAN TAYLOR: *"People like to make one call and get all the answers to their questions immediately."*

PHOTO BY WEBB CHAPPELL

PUTNAM INVESTMENTS

	Concern	Outcome
End-User Acceptance	New systems might not meet end-user needs.	Locating IS personnel within business units synchronized user needs with application development.
Reliability/Scalability	Client/server platform would prove insufficiently robust for mission-critical operations.	First system stress test required memory upgrades on most PCs.
Impact on IS	Client/server developers might not adapt to systematic development process.	Staff adapted well to imposition of standard methodology.

says. "These are, after all, just tools."

Taylor also worried about client/server's robustness. "We wanted to run mission-critical systems," he says; thus, there would be little tolerance for downtime resulting from system crashes. There weren't a lot of success stories from which to draw experience when the project began, either. "Very few people had successfully completed true client/server systems," Taylor remembers. Unlike the stable mainframe environment, client/server was a realm like a Wild West town, lacking technology laws. "In the early days, there were no [software development] standards. The [software] jockeys were running systems, and some manufacturers and vendors were announcing products before they were ready," he says. Taylor worried that such an untamed climate wouldn't meet Putnam's needs. He didn't approach the challenge timidly, though. "We put up a [mutual fund] pricing system, which is one of our most critical systems, first," he says. "We felt that would force us to develop the right disciplines and methodologies to follow [on future projects]."

Taylor forecast some headaches going into the project, and much to his chagrin, they were realized. "Our first stress test failed because the client wasn't powerful enough." That meant beefing up the company's PCs with additional memory. Testing was (and continues to be) a challenge because so many components—PCs, LANs, wide area networks, servers, application software, etc.—require testing. "You have to test each component separately and then do [systemwide] integration testing," Taylor says. Testing on mainframes, with a single vendor and dumb terminals, was simpler.

The new platform carried some personnel management issues as challenging as the technical ones. "Culturally, you were dealing with a different breed of [software developer] that was not used to a standardized, systematic process," Taylor says. Getting client/server developers to adhere to standard processes didn't turn out to be as difficult as it first seemed, though. "Most people do like some structure," he says.

To reap maximum benefit from client/server, align systems with business strategies.

Technical and IS management issues aside, what enables companies to reap maximum benefit from client/server is an alignment of systems with business strategies and requirements; therefore, user input is crucial. To address that issue, Taylor created an IS "client services" group that works closely with each of Putnam's main business functions. Members of the group spend their entire day working alongside users to "partner with the business groups so that they understand both their psyche and their business needs," Taylor says. "Their job is to translate business strategies into tactical [application development] strategies."

"Gavan's people hear us talk while we're working under the gun and understand our business problems," says Browchuk. Browchuk's traders contributed to the nine-month equity trading system development by offering their preferences about font sizes, colors, function keys and the like. That input has been essential to user acceptance on many systems, Taylor says. Of course, there is still a constant push-pull between users and IS over system features and other issues, but Taylor says he considers that tension healthy. "We [still] have some robust discussions over timing and the phasing in of projects," he says. Fortunately, client/server's scalability allows Taylor to phase in and upgrade systems incrementally. Furthermore, he can budget for new systems over time instead of all at once. "On the mainframe, when you did a major upgrade, you had to go out and spend $4 million," he says.

But technical shortcomings still plague client/server technology, Taylor says. There are insufficient tools for scheduling, load balancing, change control and "all the [well-developed] system monitoring that you had on the mainframe." Additionally, "there's no doubt that we need to get better tools to fix PCs remotely and ones that automatically diagnose problems." That said, Taylor is bullish on client/server. "The client/server world has matured. It's no longer in the embryonic stage."

City of Sunnyvale, Calif.

Municipal government

Employees: *750*

CITIES' FISCAL WOES MIGHT not get as much ink as the federal government's these days. But local politicians and government managers may face more intense scrutiny than their federal counterparts because they are held directly accountable for their performance by their neighbors. For example, when local governments tighten their belts, services such as recreation programs, perceived as "frills," go on the chopping block first. Still, a vocal minority will become irate when cities cut kids' summer activities or senior citizens' programs and may vent their frustrations not only in the voting booth but when they meet their city officials in the neighborhood supermarket checkout line.

The city of Sunnyvale, Calif., devised an innovative solution to the dilemma of retaining popular programs while slashing budgets. "The only way to save these programs is to make them self-supporting enterprises [by charging user fees]," says Encarnacion "Shawn" Hernandez, Sunnyvale's director of information technology. That requires department managers to closely monitor income and expenses for each program every week or month. The client/server platform makes it easier to perform this activity-based costing function. "A traditional [municipal] accounting system deals only with expenses," explains Tom Lewcock, Sunnyvale's city manager. Traditionally, department managers haven't had to track income according to specific programs. By contrast, the new financial system will provide managers with easily accessible financial information that can be viewed in a number of ways, including graphically, to determine whether a specific program is paying for itself.

Client/server also offers flexible, modular systems enabling periodic small-scale modifications—traits that convinced Lewcock to support the city's migration from a Hewlett-Packard Co. mainframe. Hernandez's staff began the migration in early 1995, and the financial system will be ready by September 1996, he says. "It'll have to be. That's when we start preparing the [annual city] budget." So far, the cost of the project "has been pretty much what we forecast," says Hernandez. Sunnyvale is spending $1 million for the development of the financial applications by KPMG Peat Marwick. That figure "was an eye opener," Hernandez says, because the city had been using relatively inexpensive home-grown systems. If client/server fulfills its promise, Lewcock reasons Hernandez's staff will benefit from more efficient development project scheduling, and users will reap improved functionality faster, not having to wait several years for systemwide projects in order to gain, say, a better cost-tracking program. Mary J. Bradley, Sunnyvale's director of finance, who has developed financial systems in the private sector, says many time-consuming paper-intensive processes like the creation of the city's annual budget will be streamlined when they go completely electronic and eliminate paper.

PHOTO BY CINDY CHARLES

SHAWN HERNANDEZ: *"You can't do training too far in advance."*

"IS is going to change to be more like a consultancy, offering more hand-holding support."

–Shawn Hernandez

The city's investment of $1 million in the new financial system "did not require a hard sell" to Sunnyvale's City Council, Lewcock says. "They understood how important the system is to everything that goes on in the city and were very supportive right off the bat."

Sunnyvale, a pioneer in the movement to reinvent government, has garnered plaudits from Vice President Al Gore's National Performance Review and other groups for such planning and for performance-based budgeting exemplified by the recreation programs. As the city continues to hone these processes, managers develop more sophisticated accounting procedures requiring more computing horsepower.

"The information we need is number-crunching intensive," says Bradley. The new systems will enable the city to refine accounting and budgeting processes further. "We couldn't continue to do that without them," Bradley says. Developing indexes, charts and graphic representations of data, for example, was not feasible on the mainframe.

Hernandez had some major concerns going into the project last spring (see "Risky Business," *CIO*, May 15, 1995). "My main concern was, 'Will the staff be up to par?'" All of the programmers on Hernandez's

MARY BRADLEY *and* **TOM LEWCOCK:** *City officials hope to streamline budgeting processes and eliminate paper.*

28-person staff were Cobol legacy developers; client/server and Unix were foreign to them. Aided by consultants, Hernandez says, his staff has held its own and acquired a good understanding of the new platform. "Timing is critical. You can't do training too far in advance." He recommends training staff close to the point where they'll have to put the new knowledge to practical use.

The new platform will require his staff to deliver more end-user training than it has in the past, particularly for those who will make the leap directly from DOS applications to Windows 95. "IS is going to change to be more like a consultancy, offering more handholding support," Hernandez says.

The fast pace of change in the client/server world and its relative immaturity and instability also worried Hernandez last year. His purchasing schedule brought this concern to fruition. "We just put in our order for our production server. It's a good thing we didn't buy it a year ago, or it would be obsolete by now." Unfortunately, demand for the server and mirrored storage disks is so heavy that Hernandez will have to wait about six weeks for delivery, and the wait will cause development delays. Hernandez also longs for better system testing tools. "There's not much out there to assess load performance requirements," he says.

CITY OF SUNNYVALE

	Concern	**Outcome**
End-User Acceptance	Users might not adapt to client/server and GUIs.	System not yet deployed. IS plans to offer handholding support.
Reliability/Scalability	Client/server would prove to be immature and unstable.	Conversion of Windows NT-based relational database to Unix was a headache. Project is on track.
Impact on IS	Staff needed to acquire skill set to meet ambitious development schedule.	Cobol programmers efficiently acquired necessary client/server skills by scheduling training sessions close to when new skills were needed.

Bradley was startled by a couple of technical issues. Peat Marwick developed its Performance Accounting System using an Oracle Corp. relational database management system for other municipalities in Microsoft's Windows NT. Porting that over to Sunnyvale's chosen Unix platform was a headache. When it was first installed, "strange things happened, like screens aborting," Bradley says. "Peat Marwick has taken care of that, but [the problem] surprised us." A welcome surprise was the relative ease of transferring legacy system data to the new environment. "We succeeded on the second try," Bradley says.

Hernandez and Bradley are pleased overall with Peat Marwick and particularly with the company's willingness to support their staffs. But because the company's development team is spread out among New York; Austin, Texas; Sacramento and Sunnyvale, Calif.; bringing people together to hash out problems is difficult. For example, Peat Marwick developed the system for Windows 3.1 and Windows NT, but Sunnyvale has already converted to Windows 95. Programming glitches requiring Peat Marwick's assistance have resulted, and although much of the consulting can be done over the phone, some must be done in person. When travel is involved, one has to expect delays on the project, Hernandez says. Hernandez and Bradley say they both understand the risky nature of this project. "If we can't pull it off, we'd better have our resumes up to date," Hernandez says. If all goes well, though, both will have impressive project management qualifications to polish those resumes, and Sunnyvale will have a more effective and efficient government. CIO

Staff Writer Peter Fabris can be reached via e-mail at pfabris@cio.com.

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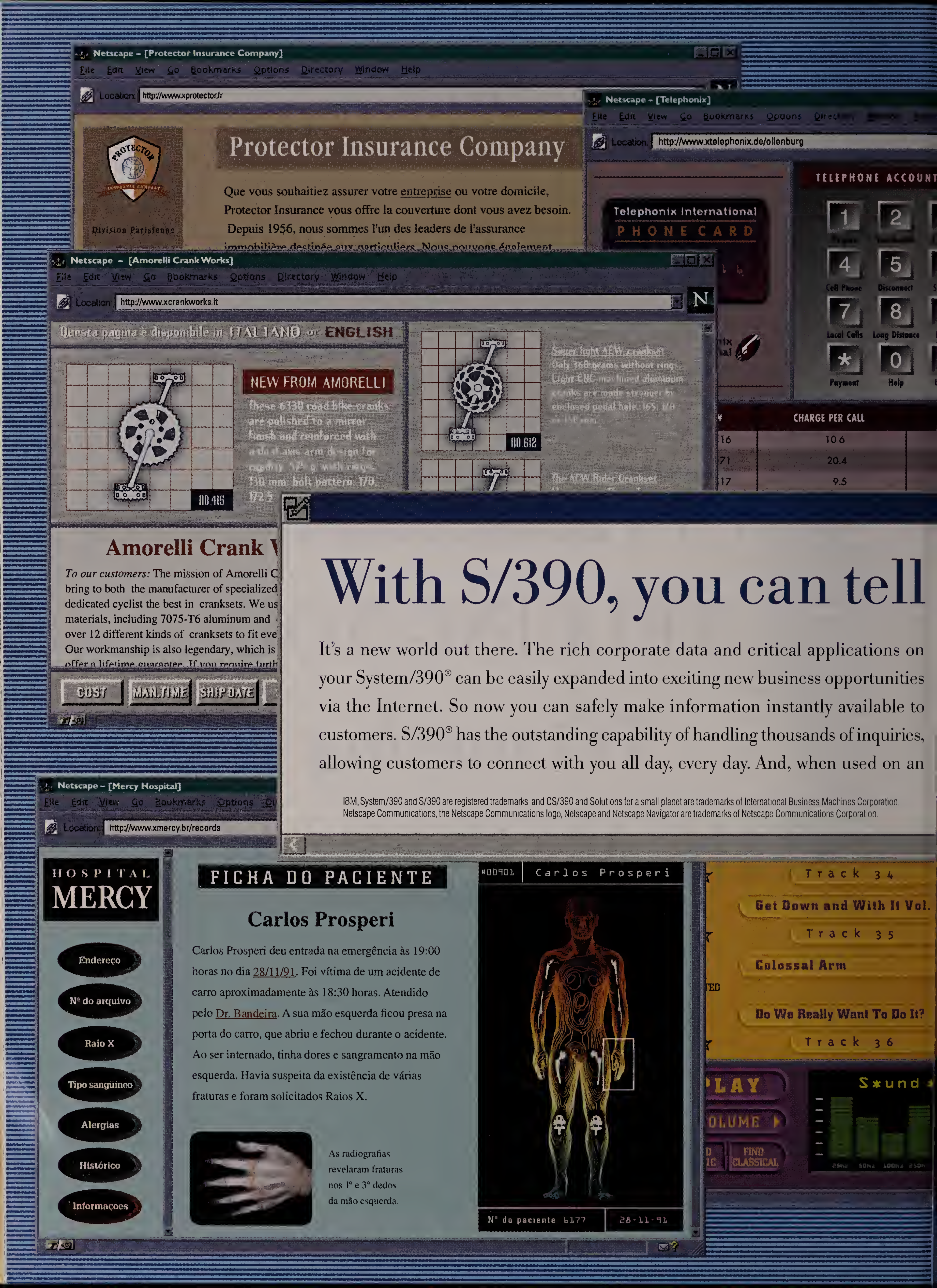
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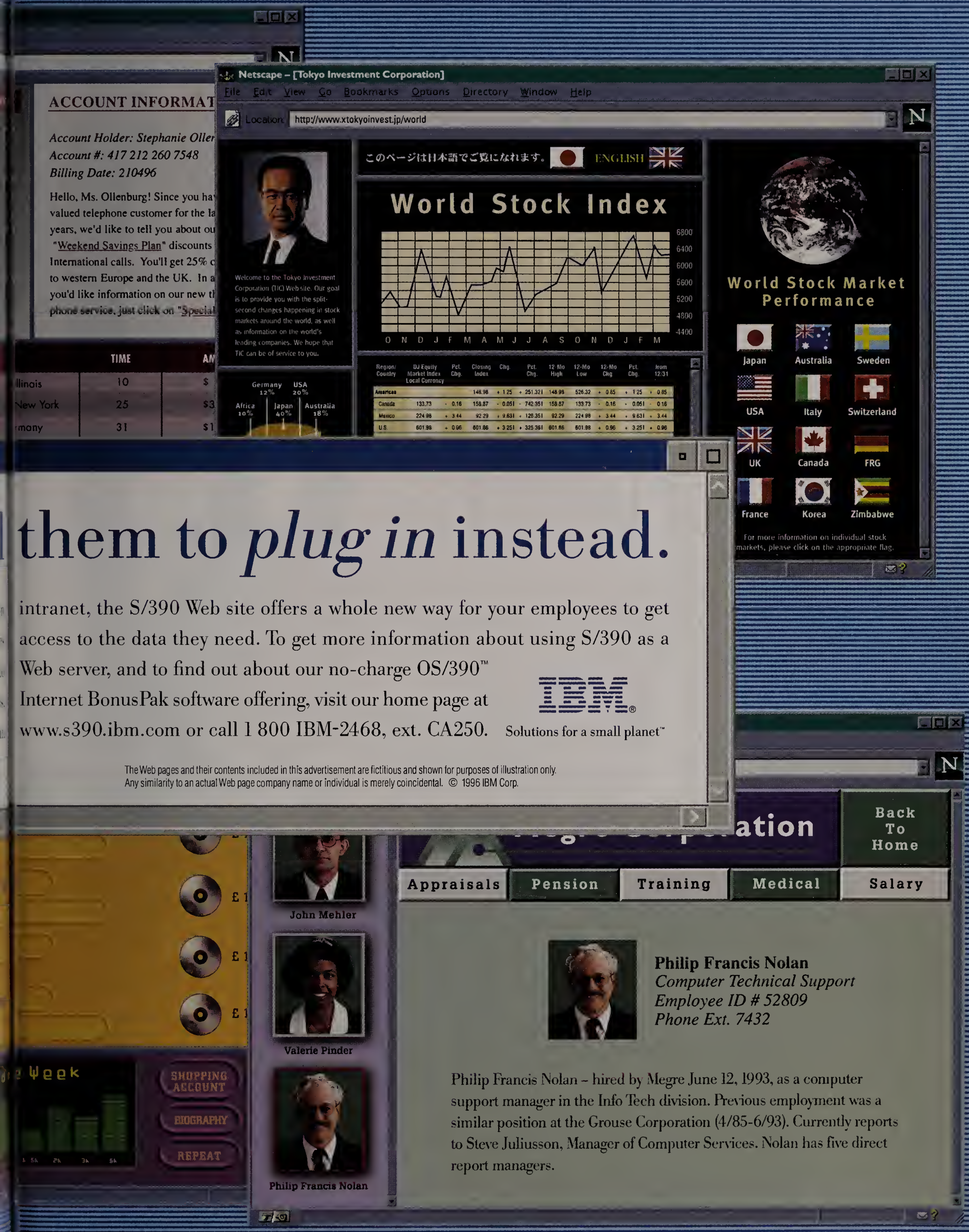

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Thick AND THIN OF I.T.

BY JOE MULLICH

Partitioning applications for client/server environments is a complex but rewarding goal

THE SAYING THAT YOU CAN NEVER be too thin wasn't created as a corporate maxim, but increasingly that philosophy has been adopted by IS departments. Companies are embracing "thin clients"—stripping application logic off desktop computers and placing it on other servers in the enterprise to enhance performance, reduce costs and improve the ability of an application to scale. But some companies are realizing that thin clients aren't a no-brainer panacea. Thin and fat is a delicate trade-off requiring companies to balance a host of sometimes conflicting technology concerns. The decision between thin and fat clients can also raise touchy people issues. The placement of application logic can have surprising influence on how end users interact with their computers and do their work.

Partitioning, the art of separating application logic to create a thinner client, started gaining attention after companies realized their initial client/server forays typically resulted in "fat" clients. The early, PC-centric client/server desktop contained a GUI and all the application logic. That setup gobbled up disk space, was inflexible, posed problems of scaleability and made deployment expensive. The bloated desktops required expensive machines to handle the computing demands placed on them. An organization with 1,000 users could easily spend $2 million on desktop hardware alone for high-end PCs to support the fat clients. The Hurwitz Group Inc. in Newton, Mass., dubbed the situation "The Fat Client Syndrome."

As IS departments looked for a new model to solve the problems of the fat client, distributed computing infrastructures (configurations in which application logic is not neces-

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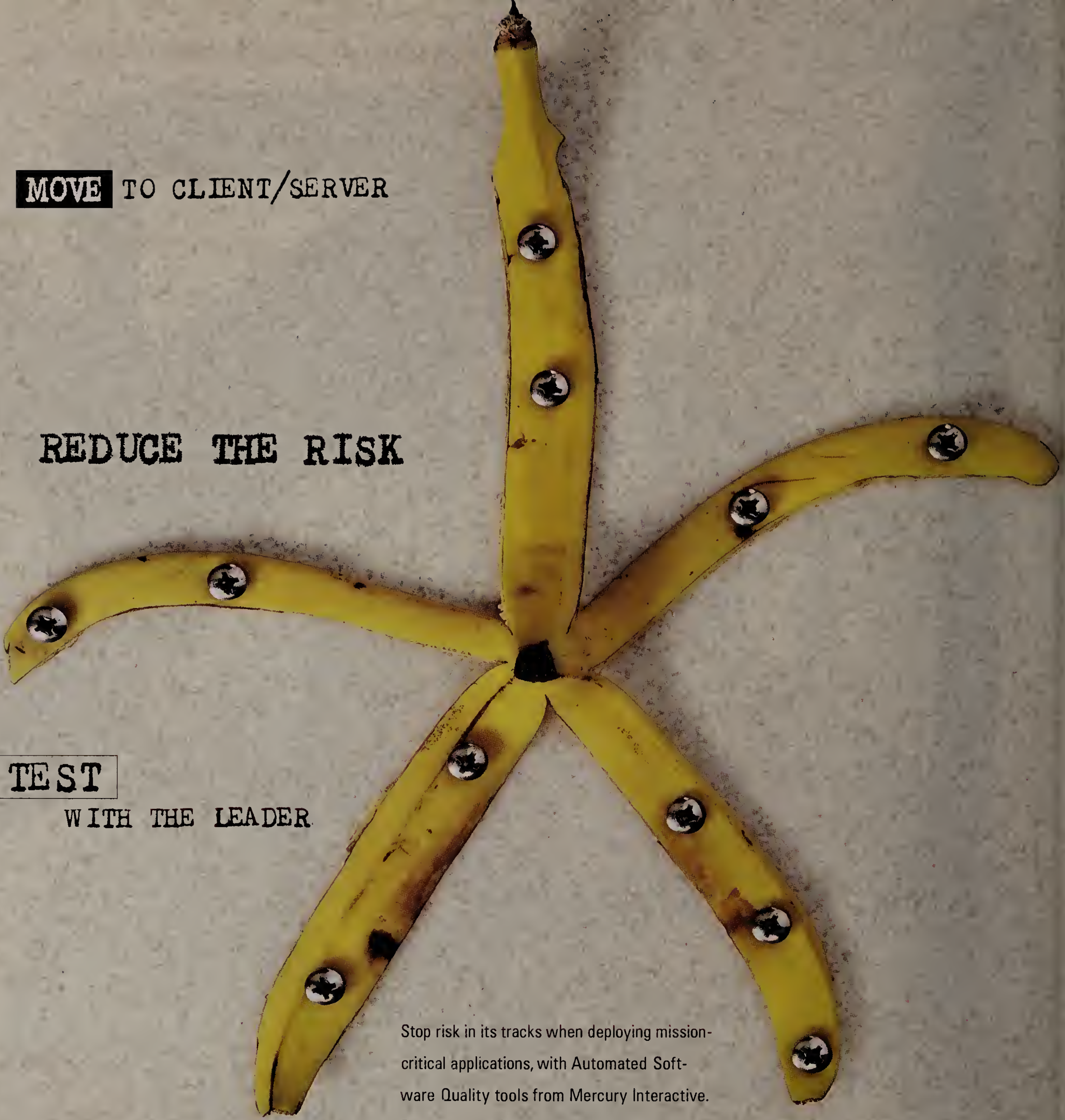

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Making Client/Server Work

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sarily located on the client) evolved. So-called three-tier client/server architecture presents partitioning options that give developers the flexibility to divide an application in a number of ways. Partitioning options have been made possible largely because of a new generation of software, such as Forte Software Inc.'s Forte and Dynasty Technology Inc.'s Dynasty Development Environment, that gives developers the flexibility to divide an application in a number of ways.

The Internet has added its considerable momentum to the push for partitioning, providing a perfect model for how thin a client can become. A Web browser, which is nothing but an interface, is the ultimate thin client. To execute programs, a browser must access the application from a server. Many believe that eventually this model may replace client/server computing, but according to Carl Lehmann, program director of the advanced information management strategy service for Stamford, Conn.-based Meta Group Inc., the browser model is immature and somewhat unreliable. Just as the Internet is becoming a model for how thin a client can be, the Internet's drawbacks—its sluggishness and chanciness—suggest some of the problems of slimming too much.

> *Thin clients are easier to deploy and maintain, and generally they are preferable for applications that have a large number of users.*

Trade-offs

Companies are beginning to see partitioning as a complex process that requires careful deliberation of the trade-offs between fat and thin. There are business operation and political ramifications of stripping power from the user's desktop, performance constraints to be wary of and ease-of-development issues to consider. A lot of corporate managers are struggling with how thin a client they should implement," says David Kelly, senior analyst and director of application strategies for the Hurwitz Group. "They are struggling with changing their development process and paradigm, which previously produced fat clients." And Bill Gonch, a senior project manager at a Fortune 10 consumer products company, neatly summarizes the technical conundrum of partitioning: "There is an incredibly complex trade-off in terms of what you put where," he says. "If you put too much on the client and have to deploy clients with insufficient horsepower, you're dead. If you pass too many messages through your network and don't have enough bandwidth, you're dead. If you go for a real thin client and don't have the server to support it, you're dead too."

As their increasing popularity suggests, thin clients offer a number of advantages. They are easier to deploy and maintain, and generally they are preferable for applications that have a large number of users. Consider a simplified scenario in which an application is used on 500 desktops. In a fat client model, every update to the application will require 500 new installations, but in a thin client model—because those 500 desktops will access the application logic located on a single server—only that one server requires updating. A business with applications that must be updated frequently, even if they don't have a huge number of

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users, will be better off with thin clients. "Fat clients have an inherent drawback when you need to make code changes," says Steve Hankins, vice president of IS for Tyson Foods Inc., a poultry company in Springdale, Ark. "That administration activity is one of the hidden costs" of fat clients.

On the other hand, there are situations that may call for a fat client. Hugh W. Ryan, partner and director of new age architectures for Andersen Consulting LLP in Northbrook, Ill., says fat clients deliver high performance functionality to users; in contrast, thin clients usually have less intensive data input and less immediate local processing. Ryan has found that thin clients are suitable for applications that process simple accounting forms, such as 401(k) retirement plans, but that more complex forms, such as reports for medical insurance, need that fatter client that afford the user more desktop functionality.

The decision for fat or skinny client/server partitioning will also vary with the bandwidth capabilities of a network. The impact on per-

Skin & Bones

Skinny clients are one thing, but are you ready for the new wave of gutless computers? The ultimate skinny client, the so-called information appliance or network terminal, is as hype-heavy as it is processing-light. But these desktop wimps can have a potent impact if employed under the right circumstances.

Information appliances are personal computer look-alikes that lack the processing and storage capabilities of standard PCs. They can contain little or no programming logic beyond that which enables network or Internet access and maybe one simple application. Applications and data reside elsewhere, on a network server typically, and are funneled to the desktops via private networks or the Internet.

Such systems, because of their inherent limitations, are most useful in departments in which workers use one program almost exclusively, such as in human resources or data entry, says Tom Rhinelander, an analyst at Forrester Research Inc. in Cambridge. Mass. Users who work mostly with network-based forms, increasingly common with the spread of the Internet and intranets, are also good candidates for these PC lites. This new class of document, the electronic form, never need appear in a paper version and requires minimal word processing and no local storage. Rhinelander estimates that 30 percent of the average company's desktop computers are candidates for replacement with their thinner counterparts.

Trimming the fat off desktops might slim budgets, too. According to an IBM study cited in a June 24 *Business Week* article, the annual cost of owning and maintaining a desktop machine can drop from an average of $9,500 a year to just $5,500 with a network computer. That's because the appliances can be upgraded, examined and controlled from a central location without dispatching humans with individual machines.

Anyone with an unexplained feeling of déjà vu need only think back to his old X terminals. In fact, some familiar names from the X terminal world—Wyse Technology Inc., SunRiver Corp. and IBM Corp. among them—are turning out network devices, incorporating increasingly powerful microprocessors and faster network connections. mart CIOs will consider what these featherweight desktops can do—and what they can't—before they choose to slim down.

–Ruth Greenberg

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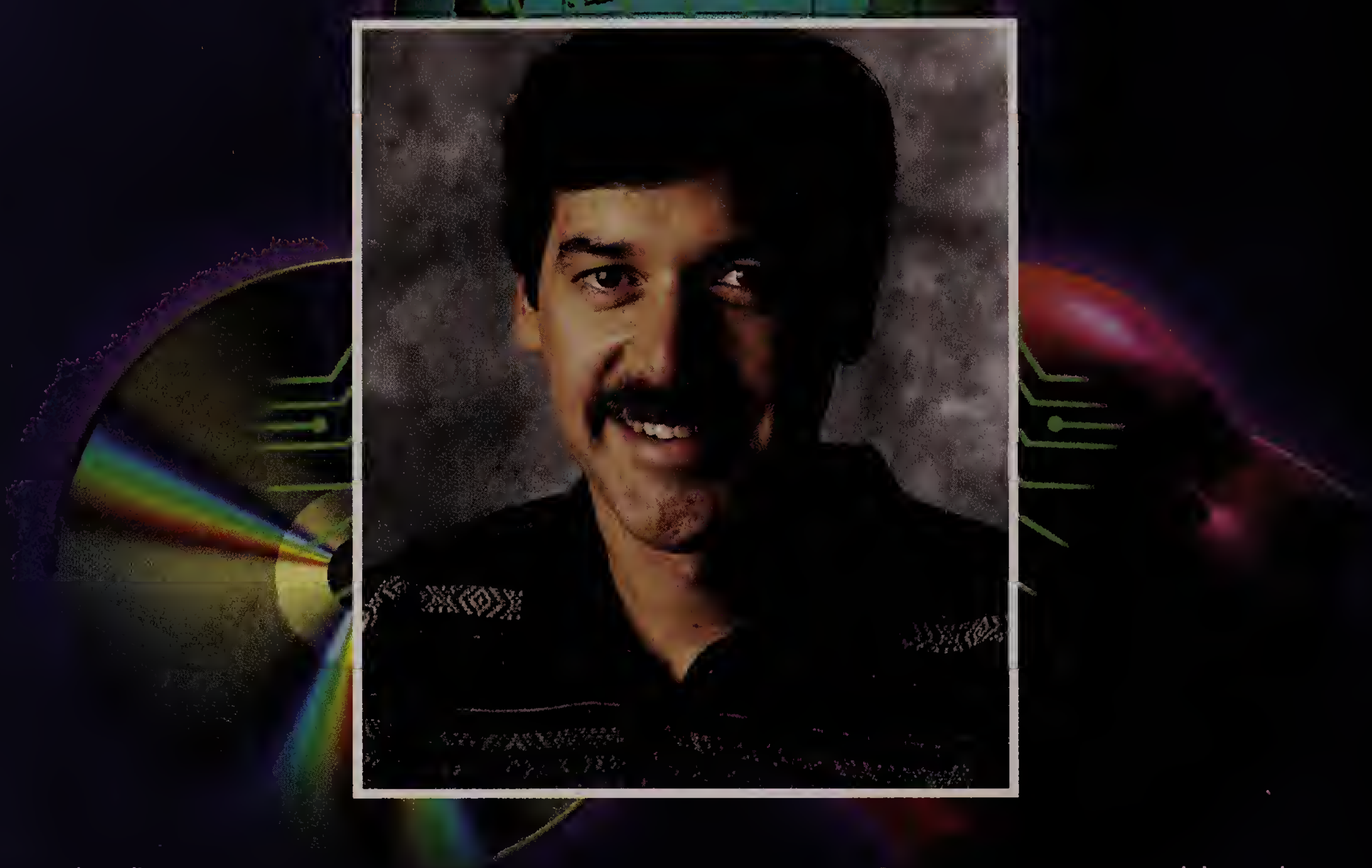

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formance of moving significant amounts of data across the network must be considered. For example, a company whose employees use a word processing system throughout the day might not want to use the Web browser model, the ultimate thin client. If the network had insufficient bandwidth, and a great number of people simultaneously tried to access the program, it could take a frustratingly long time to retrieve the application. "People are beginning to realize that servers that don't have really sophisticated operating systems can't handle potentially high volumes of data," says Kelly. "Some servers taking hundreds of thousands of hits a day can't perform at an acceptable level." The Internet itself is a model of the sluggish network. When people in the United States wake and log on, Internet traffic reportedly slows down in Europe.

Where the Logic Lies

Fortunately, thin and fat aren't absolute; all sorts of gradations exist between the extremes. Parts of the logic might reside in different places, thus creating clients of every "width." An application might have one component that is computer-intensive and a second component that demands high-performance multimedia capacities, and the differing requirements will influence where best to place those components. When managing performance, "the basic rule of thumb is to place functionality closest to where it is used," says Mark J. App, a senior client/server architect at AllTel Information Services, a computer services company in Little Rock, Ark. The logic that deals with the GUI—methods and data associated with manipulating the GUI, keeping track of the context and handling the screen data—normally reside on the client. Similarly, companies can reduce network traffic by placing logic that interacts with data on a server that is closer to the data.

Performance isn't the final partitioning decision factor; there are also ease-of-development considerations. Partitioning is a two-step process for App. First, he looks at the division of logic in terms of what is optimal for the functioning of the application. After that, he says, he must step back and reconsider the application depending on other needs, such as reusability. "One advantage to putting more logic on the server, besides performance and modularity, is to have more pieces that are reusable," App says. "First, we design how we want the system to run and partition based on that. Then there's a phase of rethinking: 'What on the server side can I make reusable?' The real gain in client/server is to develop a lot of reusable functionality that exists on the server and is not closely tied to applications."

Beyond technical issues, the choice between thin and fat clients underscores the personal dynamics of the new computing environment. By definition, a thin client strips away power from the desktop, and control is a potentially touchy issue in the user-centric world of the personal computer. For instance, Gonch has users who work at home, dialing into the network through a home PC whose configuration IS doesn't control. "Three years ago, we'd simply say you absolutely won't do that," says Gonch. "Now, we have to accept that that's the way people actually work." Such considerations may influence the placement of application logic.

Another nontechnical issue is security. Michael Frow, senior vice president and senior credit officer at the Bank of Montreal, points out that in terms of system integrity, IS might prefer that the bank use diskless terminals. However, that is unfeasible because the bank's end users must be able to download spreadsheets. From a technical efficiency standpoint, that might be an

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irrelevant issue; from an operating standpoint, it is a crucial one. "What's important? Your ability to manage the system or your ability to manage the business on the system?" Frow asks. "Managing the system is important, but if you can't manage the business you have to close the door."

Ironically, Gonch says, developers who have attempted the most elegant partitioning possible sometimes have met with the most abysmal failures. A logical partition from a technical standpoint doesn't always make sense in the real world. "The teams that have been the most remarkably successful call me up occasionally and say, 'This is what the customer really needs, but it will violate the architecture,'" Gonch says. "And I tell them, 'If that's what the user needs, go ahead.'"

Revising

Partitioning is even more maddeningly complex because it is not an over-and-done process but is subject to ongoing revision, especially during development and prototyping. A perfect example is Cincinnati Bell Information Systems (CBIS), a provider and manager of customer billing systems. When it initially designed a new three-tier client/server system, CBIS opted for a fat-client setup. That setup mimicked the logical progression from the company's legacy systems. It was also easier to write, especially during early development, when programmers weren't certain what the workflow at the client would be. "If all the logic is on the client, it's much easier to make changes during development," says James P. Holtman, vice president of systems architecture at CBIS. "If you had a thin client, you'd need to make two coordinated changes on the client and the server." But the fat-client setup presented its own problems. A heavy volume of messages had to pass between servers and clients, slowing down the system. The amount that CBIS is paid to manage billing systems is partly calculated on response time, and more messages going over the network meant a one- or two-second lag. When a company handles millions of transactions, as CBIS does, those lags can significantly reduce the number of calls workers can handle. The result: Expenses rise because more customer service representatives are needed.

CBIS decided to speed up the system by shifting some logic, such as the business rules that determine what data needs to be called up on the client when customers are ordering new products, from the clients to a server. "We put the fat client on a weight-reduction program," Holtman says. At the same time, CBIS took another step to reduce network traffic by bundling five common requests for information into one request to get the information to the client's screen faster.

Moving from fat to thin is not an easy process. "Some tools purportedly let you dynamically move logic back and forth between client and server," says Holtman. "For us, like for many companies, we have to go back in and redefine what message sets are sent between client and server. Some of the old code can be reused, but you can't just say, 'Gee whiz, today I'd like this logic here and magically move it.' Someone has to sculpt the logic out of one program and sculpt it into another, and that's a fair amount of work."

Clearly, partitioning applications on client/server architectures requires developers to consider their work in a new way. "The traditional thinking is linear," says App. "In partitioning you need a higher level of abstract thinking." That's not easy. Few things about partitioning are. However, considering the potential payback, App and others agree that it's well worth the trouble.

Joe Mullich, a freelance writer in Norristown, Pa., can be reached at MoJoe1@aol.com.

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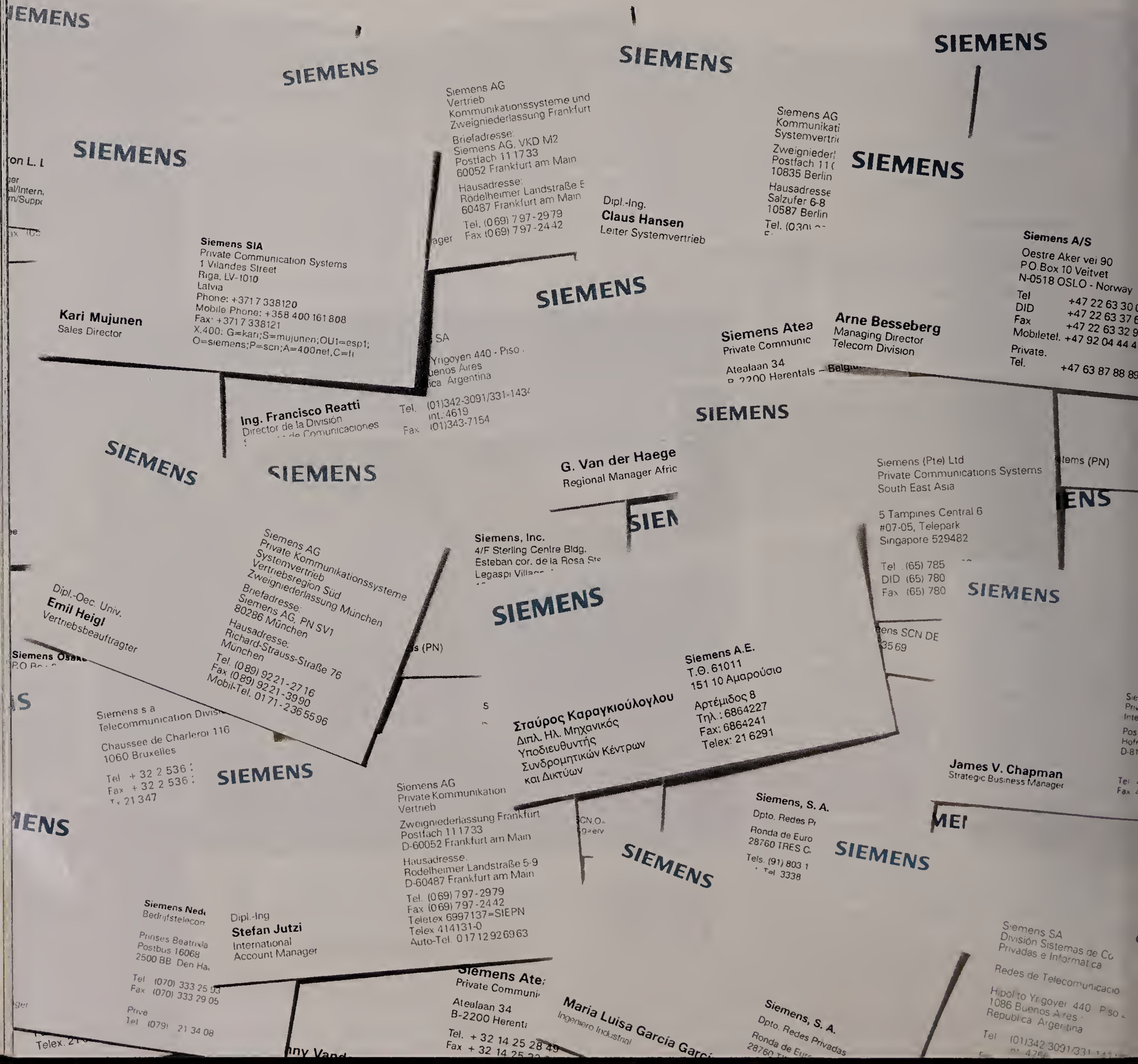

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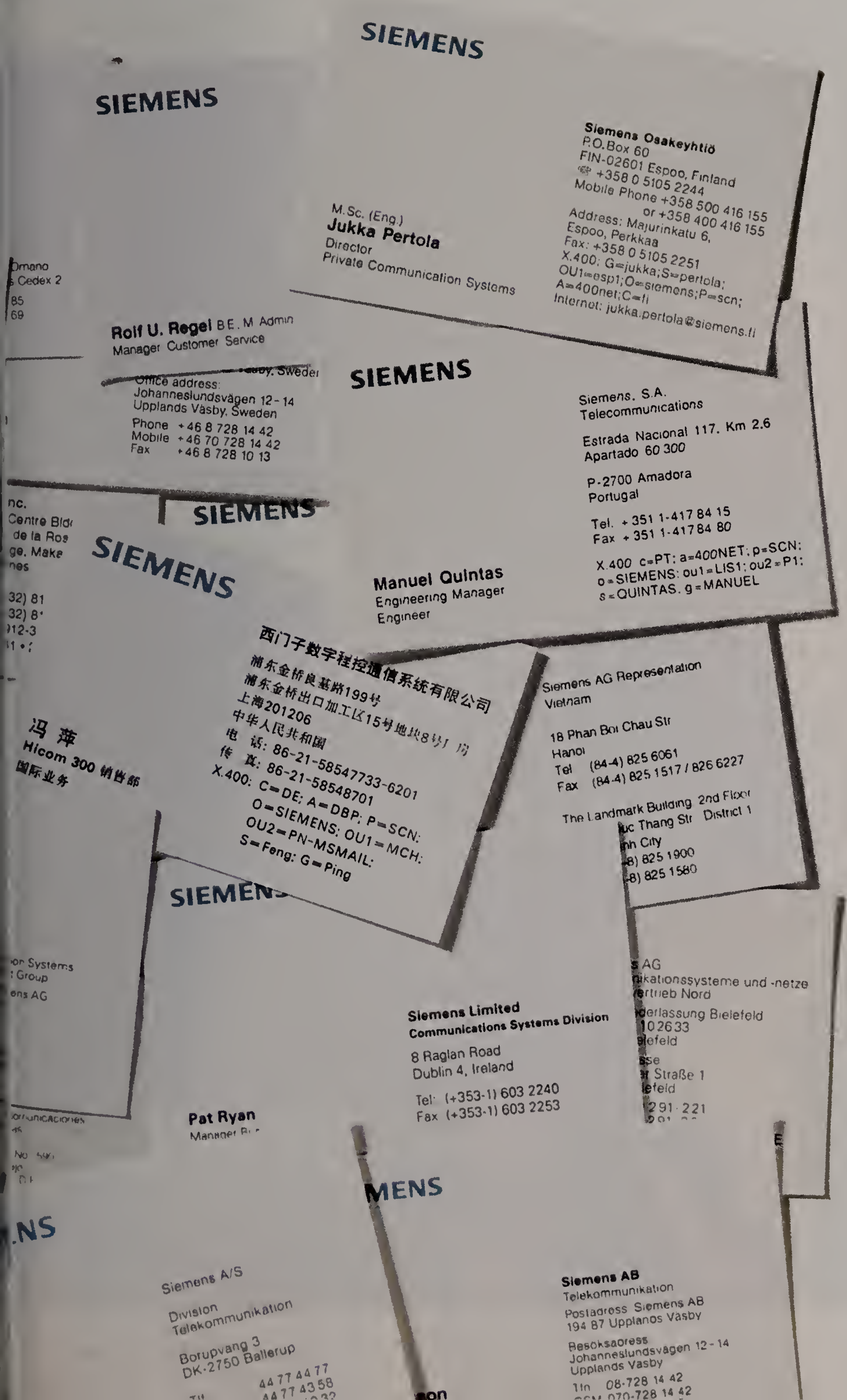

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M.Sc. (Eng.)
Jukka Pertola
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Private Communication Systems

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Manuel Quintas
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Pat Ryan
Manager

Siemens Limited
Communications Systems Division
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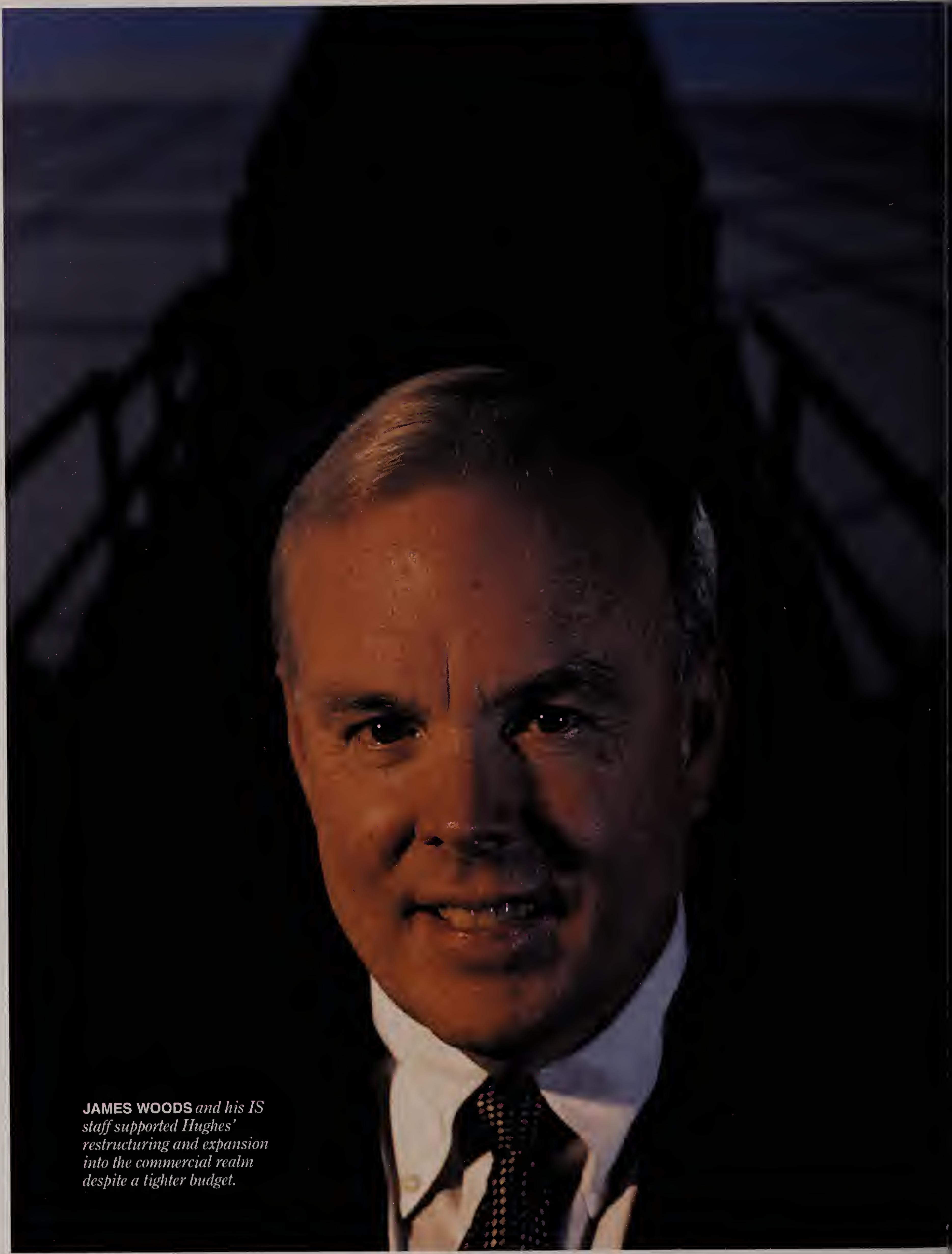

JAMES WOODS *and his IS staff supported Hughes' restructuring and expansion into the commercial realm despite a tighter budget.*

PHOTO BY LARA JO REGAN / SABA

When your business *is* rocket science and your number-one customer isn't buying many rockets anymore, you've got to rethink your whole business strategy. That's what happened at Hughes Electronics. Here's how IS helped make it all work.

Rocket Science

BY DEREK SLATER

IT'S SEPTEMBER 1992 AND C. Michael Armstrong, the new chairman and CEO of Hughes Electronics Corp., drops his bombshell on Vice President and CIO James B. Woods at his first meeting with the IS Executive Council. Armstrong doesn't mince words: "The goal is to cut operating costs by 30 percent net over two years, across the company."

That puts Woods in a bind. Surely Armstrong can't be asking him to cut IS expenses just as the rest of the company will be relying heavily on IT to run the business with less manpower. Woods decides to level with his boss. "Mike, you must understand that you can't have it both ways," he says.

But Armstrong reaches a different conclusion. "The chairman," he says, "can have it both ways."

That is the central IS challenge—and indeed, the challenge for the entire company—at aerospace and defense giant Hughes: to do more with less. By the end of 1989, executives at Los Angeles-based Hughes recognized that the thawing of the Cold War and accompanying meltdown of the U.S. defense budget had left the company little choice but to dramatically streamline its military business while seeking out new commercial markets. When Armstrong arrived in 1992, he set in motion a plan to do just that. First he downsized and mandated cost-cutting across the board. Next he restructured Hughes into a flatter, decentralized company focused on specific markets rather than gee-whiz technologies. Now Hughes is in the midst of reengineering business processes to move with greater agility in competitive commercial arenas.

Woods' IS department, similarly downsized and restructured to reflect the new corporate model, has played a key enabling role throughout the transformation. IT has been used to cut operating costs, reduce manufacturing cycle times, and facilitate coordination and communication between Hughes' defense business and fast-growing commercial units (see "IS Strategies," Page 98).

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When Armstrong left his role as chairman of IBM World Trade to tackle Hughes, revenues were stagnant at around $11.5 billion, and earnings had retreated about 30 percent from their high-water mark reached at the end of a defense budget boom cycle in 1988. Worse, the Department of Defense alone accounted for about 70 percent of the company's revenues. As Hughes' biggest customer, the U.S. government had profoundly shaped the structure and operation of the company. Because the government wanted cutting-edge technology and was willing to pay for it, product development at Hughes emphasized creating the hottest technology and meeting technical performance standards; time and money spent were secondary considerations.

"Defense companies for a long time were order-takers. The government said, 'Here's what we want you to do.' They weren't working to solve market problems," says Dwight Hanger, a Los Angeles-based partner at Ernst & Young LLP who consults for the aerospace industry. To break out of DOD dependency, Armstrong accelerated the company's expansion into commercial markets. Because commercial success hinges on market relevance and swift, low-cost development, the challenge would be formidable. "It's hard to break out of the [defense] mold when you go to the commercial market," says Hanger. "If you engineer a VCR that's a technology marvel but costs $3,000, good luck." At the same time, Armstrong set the company's sights on building its defense business by cutting overhead and gaining market share from its competitors.

The first step in Armstrong's turnaround plan was painful but not surprising: Hughes laid off 12,000 workers in 1992, taking a restructuring charge of nearly $750 million against earnings. An additional 4,000 jobs were eliminated in 1994. Nowhere is that loss more evident today than at Hughes' elegant headquarters. The spacious effect is caused by more than the vast central atrium; the building that formerly housed 1,500 corporate staff now holds about 450, with empty cubicles on each of the four floors. Many jobs that were not cut were instead pushed out to the business units. As Armstrong's early mandate to Woods suggested, central IS was not spared. "We had to pay our dues; we did aggressive head-count reduction," says Woods, who won't specify how many IS jobs were cut.

THE NEW HUGHES

Hughes Electronics Corp., based in Los Angeles, has about 80,000 employees and major facilities in El Segundo, Calif.; Tucson, Ariz.; and Kokomo, Ind. The 1994 restructuring broke the corporation into five major operating units:

Hughes Aircraft Co.
Largest operating company; includes all defense electronics product lines

Hughes Telecommunications and Space
Businesses related to satellite manufacturing, including Hughes Space and Communications Co.

Hughes Network Systems
Digital cellular and satellite networking businesses

DirecTV
Satellite-based, 175-channel consumer broadcasting service launched mid-1994

Delco Electronics Corp.
Automotive electronics business, put under Hughes Electronics umbrella by parent General Motors in 1986

But downsizing was just part of the answer. To help meet Armstrong's decree to cut costs while increasing IS support to the downsized business units, Woods turned to outsourcing. In December 1994, he designed a selective outsourcing contract with Computer Sciences Corp. (CSC) in El Segundo, Calif., for eight years of service, to the tune of roughly $1.5 billion. CSC took on 1,200 Hughes IS employees and responsibility for network management as well as mainframe and/or desktop maintenance at two of Hughes' largest operating companies and Hughes' corporate offices. On an annual basis, the deal represents about one-half the IS budget.

Eighteen months into the arrangement, Hughes and CSC are still working out the kinks in the relationship; end-user satisfaction with CSC's service levels is not yet up to snuff, and the company is behind schedule on certain operational goals. Nevertheless, the relationship between Hughes and CSC is good, says Woods, and CSC is helping Hughes tackle the gargantuan project of moving from legacy mainframes to client/server systems.

Although Hughes is guarded about its overall IS budget numbers, Woods says the company is on track to meet the business objective of reducing IS expenses by 30 percent over two years and that the outsourcing strategy is the "driving factor." Achieving that target will give Hughes a competitive advantage. Like most aerospace and defense companies, it once spent 4 to 5 percent of sales on IS; the goal of reducing that to 3 to 4 percent is now within reach. (For more information on Hughes' outsourcing contract, visit *CIO*'s Web site at *www.cio.com/CIO/090196_hughes_contact.html.*)

The next step in Hughes' competitive strategy was to reorganize around markets instead of technologies. In late 1994, Armstrong restructured the company into five primary operating units, each defined by the market it serves rather than the technology it produces (see box above). The resultant Hughes organization is much flatter; eight levels of management have been compressed to four. "We have about a third as many corporate VPs now as when Mike Armstrong came," says Woods. Each of the five operating companies has its own executive

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team, including a CIO—an arrangement Woods calls the "distributed CIO function." Those five CIOs report both to their companies' chief executive and to Woods, the corporate CIO, and serve with him on the IS Executive Council, which sets corporate IT standards.

Before the restructuring, the 1,200-worker corporate IS staff, headed by Woods, functioned as a service bureau supporting a hodgepodge of computing systems that had sprung up in the technical centers in each operating unit. "When I first got here, there were 34 different purchasing systems," says Armstrong. In support of the new market-focused structure, Woods' central IS department now numbers about a dozen people. It has shifted to "governance mode" and its function is now setting directions and standards rather than providing data processing services.

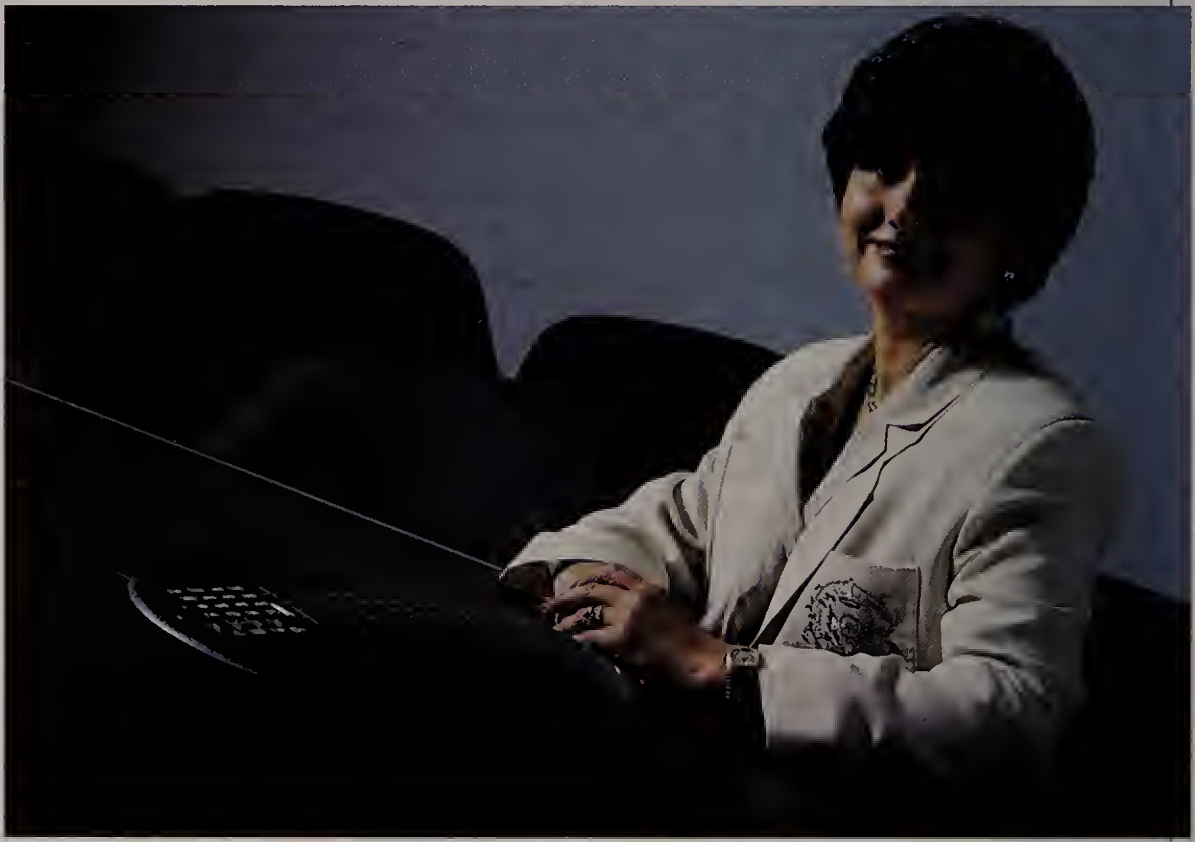
The challenge in that is to strike the appropriate balance between the need for common systems and the particular needs of the business units. (For example, cc:Mail and Microsoft Office are used companywide, but each operating company has its own manufacturing shop-floor control system, since manufacturing considerations differ from one unit to the next.) That delicate balancing act is performed by the IS Executive Council, which Mahvash Yazdi, vice president and CIO of Hughes Aircraft Co., characterizes as a collaborative, cooperative group. "At the end of the day, the business is in the driver's seat to make decisions," she says. And now that each business unit has its own CIO, IS is better poised to help each business unit make better decisions.

With costs contained and an organizational structure aligned to business objectives, Hughes began reengineering business processes to help the business units work together to meet customer needs more efficiently and bring products to market more quickly. Since reengineering started in earnest in 1993, Woods and his five CIOs have been working on several initiatives to help meet those objectives. The goals of those projects are to allow collaboration among commercial and defense business units, cut costs by replacing custom code with off-the-shelf software and support formalized business processes where the old Hughes functioned in a purely opportunistic manner. In fact, the IS Executive Council now funds new IS projects only if they support reengineered business processes.

> *A standard satellite requires about 10,000 parts, and those parts are stored in Hughes' warehouse almost entirely at random. The location of every part is tracked solely by the MRP II system.*

Perhaps the most important IT enabler in the reengineering process has been Hughes' decision to move to a client/server environment. From a technical standpoint, Hughes' migration puts the company out in front of many aerospace and defense contractors. "To a large degree, [defense] companies sat out the client/server revolution because they were busy trying to survive. They clearly had more important things on their plate," says Carleton F. Kilmer, managing partner of industrial products at Andersen Consulting in Boston. Hughes, on the other hand, was already implementing client/server in 1993. One result of this forward thinking is that client/server is making it possible for IS to do more to support the company's business objectives on a tighter budget. For example, it enables the company's new cross-functional integrated product teams to access relevant information needed to make wise business decisions, regardless of whether that information is from manufacturing, materiel, engineering or finance systems.

One of the first applications to leverage client/server's capabilities is an ambitious product data management (PDM) system that fosters collaboration between business units. The $70 million initiative uses software from Sherpa Corp. in San Jose, Calif., to put engineering documents and drawings, parts lists and bills of material online. It consolidates a variety of incompatible PDM systems that were running on mainframes



As CIO of one of the company's five major operating units, **MAHVASH YAZDI** *exemplifies the distributed CIO function at Hughes.*

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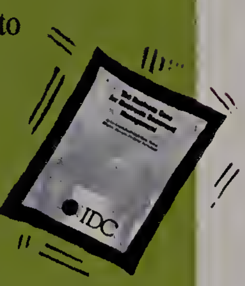

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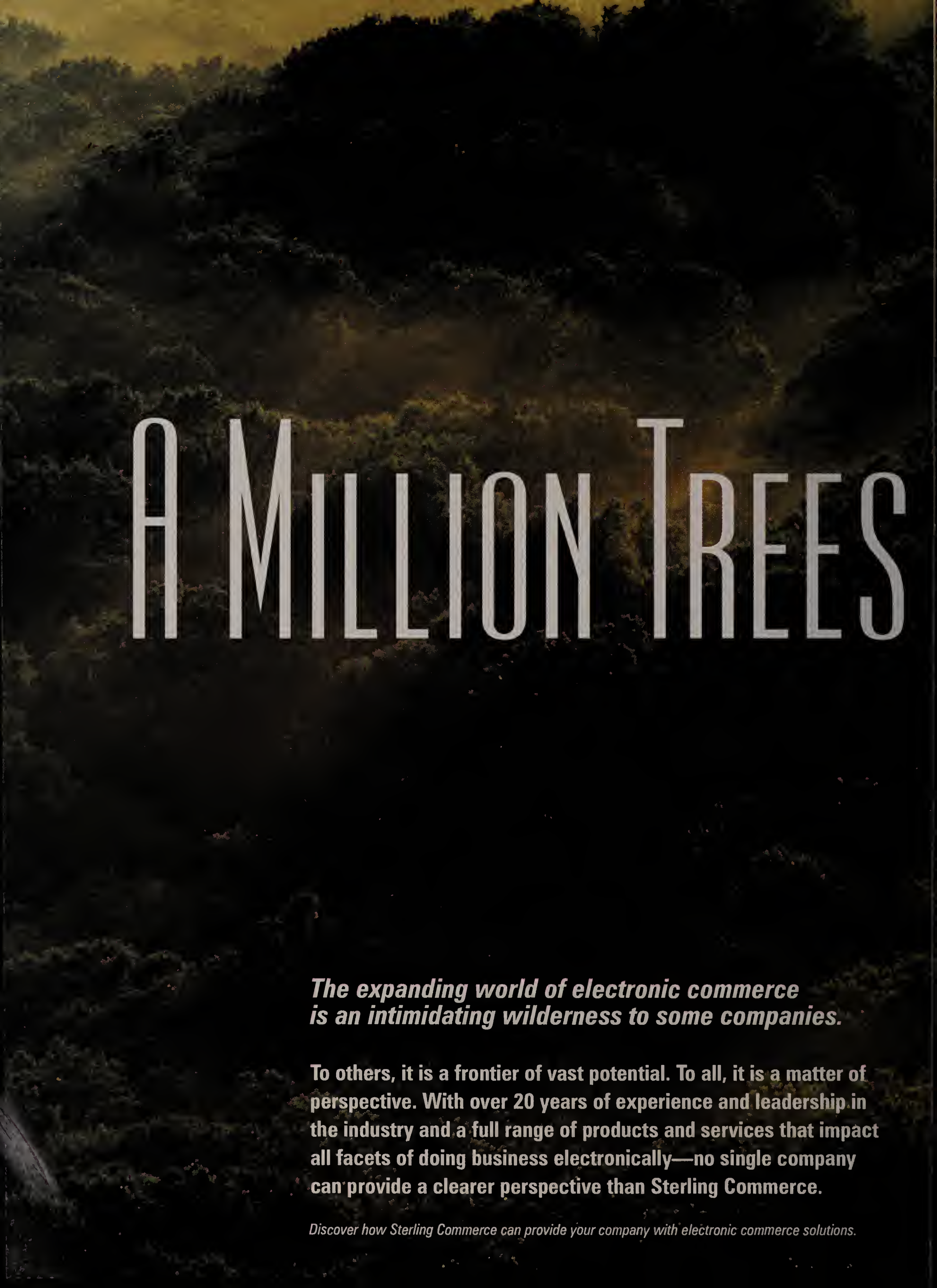

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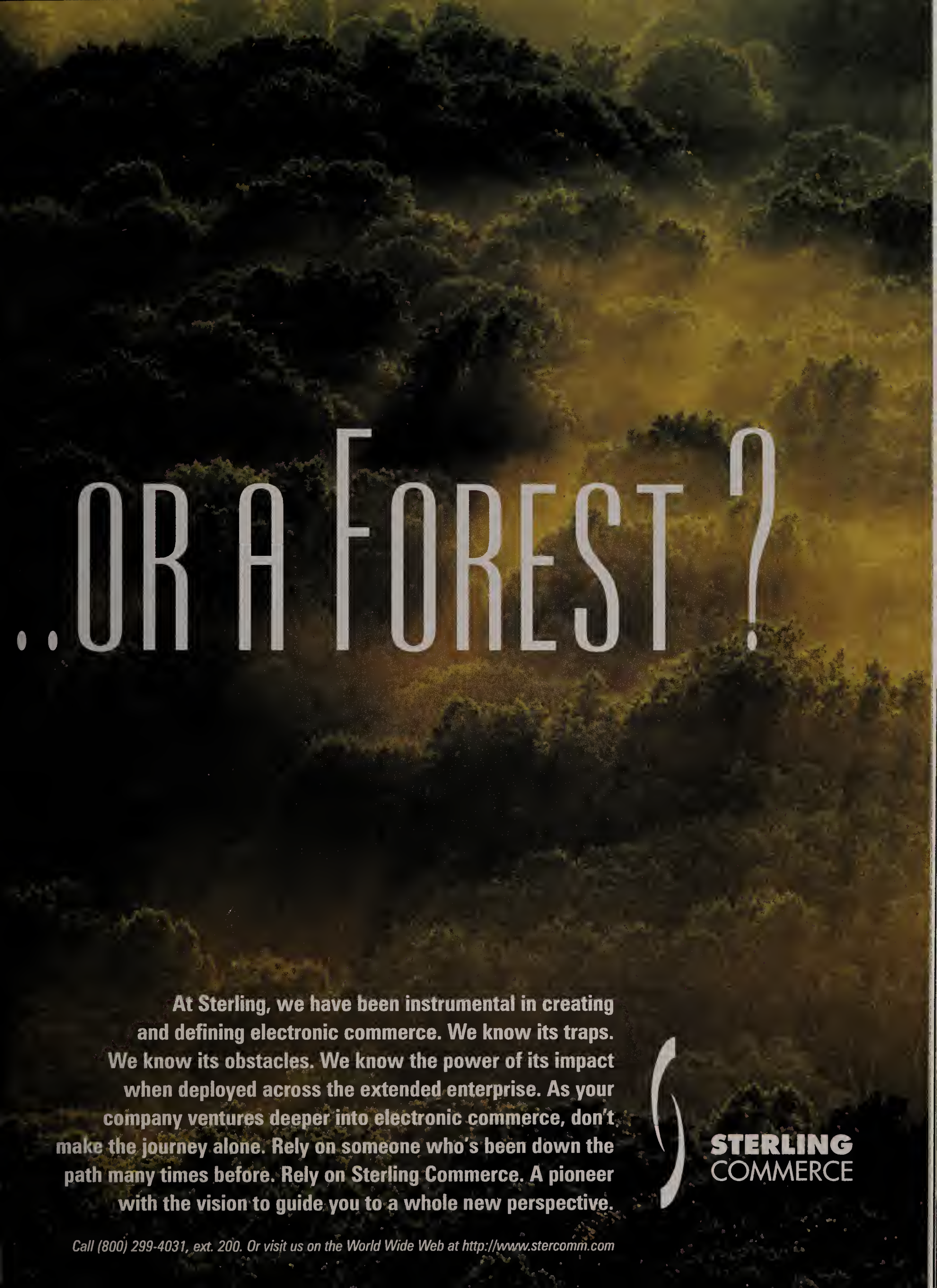

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ROBERT KLATSKIN *and* **JAMES FREEMAN:** *Managing parts inventory and engineering documents online helps Hughes launch satellites like this one more quickly.*

PHOTO BY LARA JO REGAN / SABA

within the old Hughes operating groups and incorporates data that was previously paper-based and scattered throughout Hughes technical centers.

"Just having the data online was a big improvement instead of walking among a half-dozen buildings to find out who owned a specification and get ahold of it," says James Freeman, operations leader for product data systems at Hughes Space and Communications Co. (HSC). While the new system isn't without risks—if it goes down, engineers can't do their work—engineers no longer need to spend several days redrawing a part; with the old system, redrawing a part was often quicker than finding an existing design document, says Freeman.

The PDM system's built-in security options allow Hughes to connect electronically to its suppliers and customers, letting them track the progress of each order. That lets Hughes slash communication times, particularly on international contracts. One Hughes project has 10 European companies plugged into Hughes' PDM system. An engineering change that requires multiple sign-offs can be accomplished in hours or days, a far cry from the month or more it took under the old system.

But everything didn't go exactly as planned. Indeed, the immaturity of client/server computing has hindered the project.

"First we had hardware engine speed problems," says Woods. "Then the database management system wasn't robust enough. Then we needed more simultaneous write/read multithreading capability, so Sherpa is rewriting code for that. Now we're dealing with network traffic, which is very hard to predict." As a result, the system is not as fully deployed as originally expected. In spite of the lagging rollout, Woods expects the PDM application will meet the original goal of paying for itself within three years of becoming fully operational.

The move to off-the-shelf software such as the Sherpa PDM application represents a dramatic change in strategy for IS at Hughes, which had long viewed custom application development as a source of competitive advantage. But to meet the objective of making a tighter IS budget work harder than ever, the company is dropping custom software development and forming partnerships with software vendors. Woods, Freeman and others at Hughes have worked with Sherpa to define areas where the product lacks important capabilities; the vendor is responsible for developing those features, which can then go into the standard commercial version of Sherpa PDM software. That off-the-shelf approach cuts software costs for Hughes and puts the burden of maintenance on the vendor, which benefits from real-world product testing and development.

At HSC, the PDM system links directly to a new client/server manufacturing resource planning (MRP II) system that manages parts inventory levels for satellite manufacturing. By reducing manufacturing cycle time, the MRP system will help Hughes expand its presence in the

Technical Profile: Hughes' Client/Server Systems

Formerly an IBM mainframe shop, Hughes has moved all enterprise-wide application projects to its client/server network.

Servers: Digital Equipment Corp. Alpha AXP systems and Sun Microsystems Inc. Sparcstations

Clients: Engineering workstations primarily from Hewlett-Packard Co. and Sun Microsystems Inc. with some Silicon Graphics Inc. and Digital units; non-engineering clients: 40 percent Macintosh systems and 60 percent PCs running Microsoft Windows 3.x, eventually moving to Windows NT

Networks: About 450 Ethernet LANs running Novell software. FDDI backbones at three major campuses; multiprotocol WAN—principally TCP/IP with some remaining SNA links; Cisco router technology; network management via CiscoWorks and HP OpenView; 60 international sites connected by frame-relay circuits from multiple providers, including Sprint Corp.

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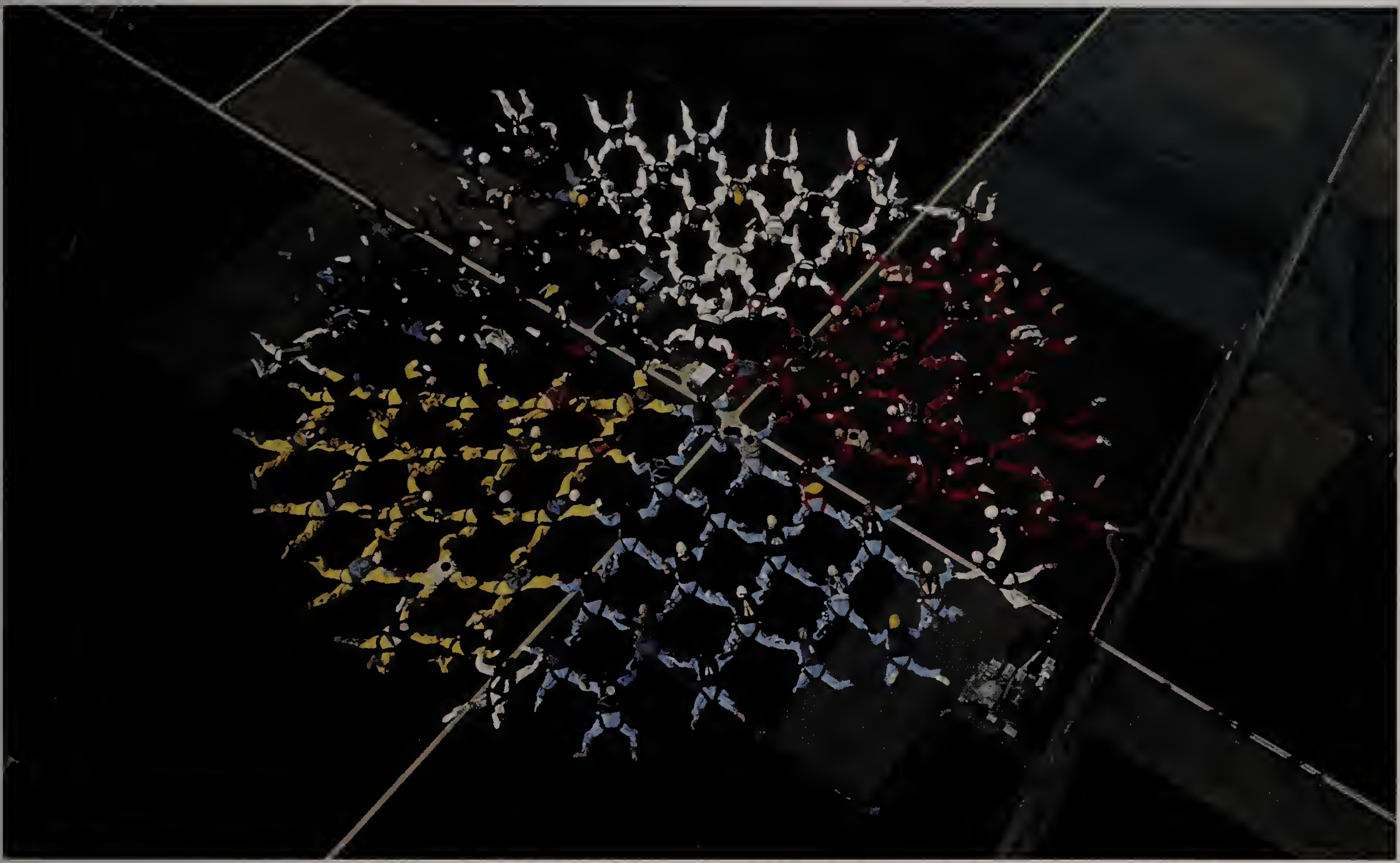

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commercial satellite market. An early launch can often mean a big market lead for emerging satellite-based services, so the manufacturing company that can build a high-quality bird fastest will get the contract to do so. In the past, a satellite could launch into orbit no sooner than three and a half years after the order was placed. Hughes' goal is to achieve one-year turnaround.

I.S. STRATEGIES

Business challenge: Cut costs

IS strategies:

- Outsource desktop and network management
- Replace proprietary software with off-the-shelf applications; partner with vendors to ensure Hughes' requirements are met

Business challenge: Increase competitiveness in commercial arenas

IS strategies:

- Cut manufacturing cycle times through MRP II inventory management
- Implement new systems such as Business Intelligence Network to help capture new contracts

Business challenge: Develop synergy between defense and commercial business units

IS strategies:

- Develop global requirements for shared PDM system
- Business unit CIOs and corporate CIO sit on the IS Executive Council to develop cooperative projects

HSC's parts warehouse is tucked away in a clustered campus of metallic buildings that attracts frequent inquiries from movie companies seeking futuristic shooting locations. (Sylvester Stallone played a scene from *Demolition Man* in one of the buildings.) The warehouse itself, with its low ceilings and clean, nondescript rooms filled with racks lined with brown cardboard bins, is not particularly photogenic. What is striking is that a standard satellite requires about 10,000 parts, and those parts are stored in the warehouse almost entirely at random. Any given bin might contain one, two or six electrostatic packages of electronics components bearing no apparent relation to one another. The location of every part is tracked solely by the MRP II system, using bar-code labels, 386-based handheld scanners and JIT from Interactive Inc. in San Diego—more off-the-shelf software.

When a bill of materials comes over from the PDM application, the MRP II system directs a warehouse clerk to the correct bins. Location accuracy test results score 98 percent to 100 percent, says Robert P. Klatskin, director of resource management systems for HSC.

Previously, all parts were sorted and stored by project and, further, by part number. When a new part arrived, storeroom workers had to shift all the other bins aside to make space in the right spot—a time-consuming process called "snaking." That meticulous storage process was not only slow, says Woods, it was inaccurate. "Let's just say we weren't proud of the [accuracy test] numbers before," he says. The new MRP II system also flags parts upon arrival when they are in short supply or needed immediately on the factory floor. The parts can then skip their incarceration in the warehouse and be shipped directly to manufacturing, cutting out a delay of days or weeks. That not only speeds manufacturing, it also allows HSC to reduce its inventory and move toward just-in-time parts delivery.

There are plenty of other application and reengineering projects underway to keep Woods and company hopping. At the front end of the business cycle, Hughes has created its Business Intelligence Network, a Lotus Notes-based set of databases and applications that supports formalized methods of going after new contracts. Notes is also the communications link between six newly installed "leveraged procurement agents" who purchase commodity items for all of Hughes' businesses, bringing down prices by appearing to their suppliers as a single, $15 billion entity instead of a mishmash of separate buyers.

Another new application, the Technology Intelligence Network, resides on Hughes' intranet and helps locate technical documents and track expertise among the company's workers.

Woods hopes to pick up the pace further. "If you ask me what we don't do well, we don't reengineer fast enough," says Woods. Then again, he says, "We're assimilating about as much risk as any IS organization our size."

Armstrong himself is keeping a close eye on much of this risk. HSC's Klatskin recalls, "I got a note from Armstrong last year saying, 'Gee, I gave you all this money to do this [MRP II project]; come tell me how it's going.' "

That might be expected, considering Armstrong's background as an IT salesman. "I quickly forgot my [IT vendor] upbringing and became duly impatient that [IT projects] cost so much and aren't completely done within a year," Armstrong says, "but I'm pleased with how our IS team has responded." After all, the bottom line indicates Hughes is on track. Overall revenues have jumped over that $11 billion plateau, reaching $14.8 billion in 1995. Revenues from the telecommunications and space segments rose nearly 20 percent from the year before, with increased profitability foreseen in 1996 as the new DirecTV service hits the black. DirecTV's 175-channel satellite broadcast business launch was among the most successful consumer electronics startups ever, reaching 1.7 million subscribers in its first 18 months. HSC also has its largest backlog ever of satellite orders.

Not only that, but defense-related operating profit from Hughes Aircraft rose slightly in 1995. It seems these days that the traditional defense supplier, with ammunition from IS, is winning battles on many fronts.

Staff Writer Derek Slater can be reached at dslater@cio.com.

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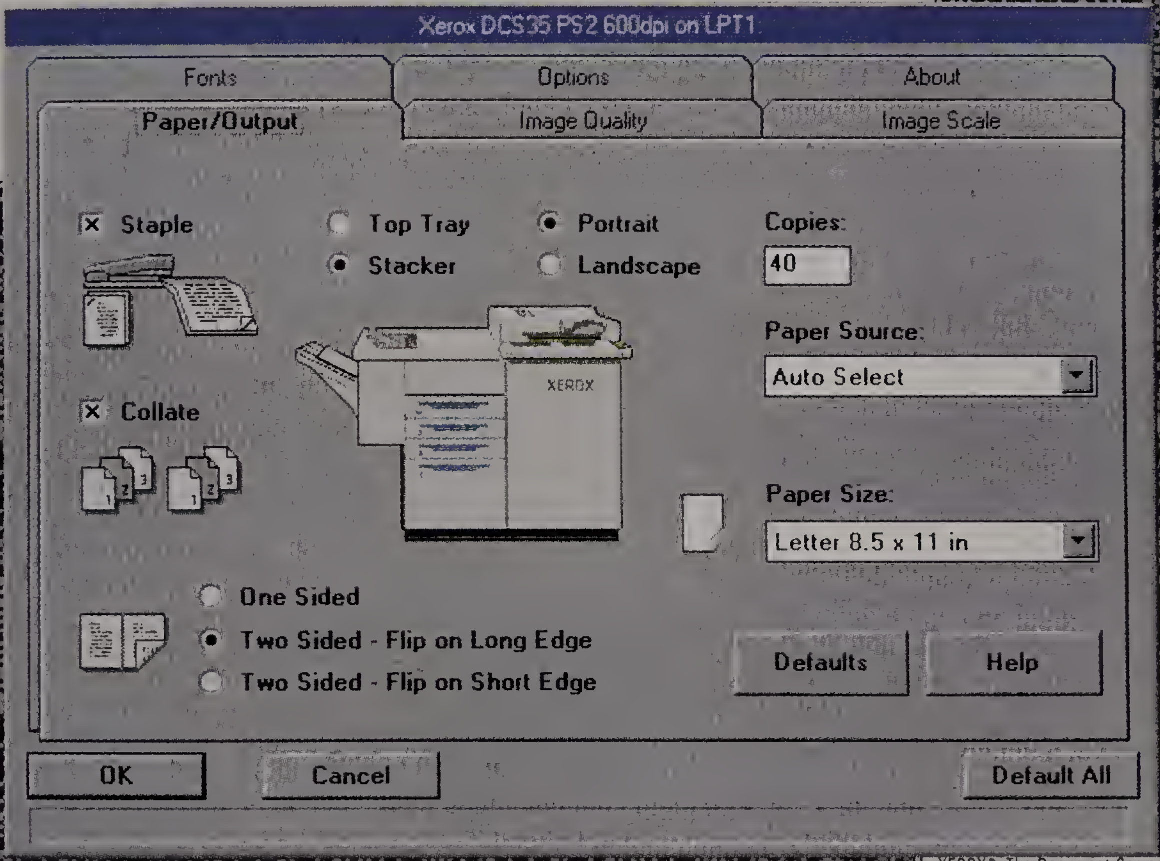

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Further Discussions

Excerpts from *CIO*'s first online feature forum

Installing SAP AG's packaged enterprise resource planning (ERP) software can make or break a CIO's career. It can also have a profound impact on corporate budgets and business processes. With so much at stake, *CIO* devoted much of the June 15, 1996, issue to SAP and its implications. The subject's critical nature and complexity also made that series the perfect launching pad for our first online feature forum that ran from June 17 to July 3.

Judging from the response of participants and the level of dialogue, our feature forum fulfilled its mission—and then some. The topics included changing the corporate culture, consulting costs, getting the right start on a project and staff retention. We are including some excerpts here to give those of you who missed the forum a sense of the discussions facilitated by an interactive medium. If you have Internet access, you can view the complete forum at *www.cio.com/forums/SAP.html.*

Year 2000 Forum

BASED ON THE SUCCESS of our first venture into interactivity, we've decided to hold online feature forums on a regular basis for important topics whose coverage will be enhanced by sources and readers talking to each other. Our Sept. 15, 1996, issue of CIO will include a story about the thorny and daunting challenges of the year 2000 date conversion. If the year 2000 poses challenges for you and your organization, we invite you to participate in our second online forum, running Sept. 16-30 at *www.cio.com/forums/year2k.html.*

Culture

The culture of the organization plays a role in project scheduling

Author: Eileen Basho, vice president of professional services, SAP America Inc.

In considering enterprise software, I think it's important for a company to separate the software from what the company is trying to accomplish with the project. The business dynamics play a big role in the degree of complexity. The degree of change and the culture of the company also play a large role. If it's been awhile since the company changed the way it does things, that must be factored into the planning.

We've realized that we need to be more proactive in helping our customers understand the issues they're facing before they commit to R/3. We won't be in there doing the business-process reengineering with them, but we will provide customers with a set of benchmarks to guide them through the decision-making process.

Response: Technology doesn't change culture

Author: Tom Davenport, professor and director of the Information Management Program, University of Texas at Austin

I agree that the cultural and organizational ambitiousness have a lot to do with the difficulty of an SAP implementation. One of the problems, however, is that firms assume that SAP—more or less by itself—will change the culture of the organization. If SAP, the company, communicated strongly that no software package can change a culture without concerted efforts from managers, you'd probably have a higher implementation success rate. Maybe the company does that already, but a lot of its customers aren't getting the message.

Consulting Costs

Why does ERP consulting cost so much more than the code?

Author: Christopher Koch, senior writer, CIO

I'd like to invite comment on the issue of consulting for ERP systems. Why do these projects run up such high consulting bills? Is there a way to better manage consultants so that the business modeling and implementation services they provide don't break the bank?

Response: Consulting doesn't have to cost so much more

Author: Sam Wee, a director of information technology

We spent 75 cents on consulting for each dollar of software over our first three years.

We purchased R/3 in April 1993. In July 1993, our first live sales and distribution transaction happened in France. Today we have 20 entities in 18 countries processing sales and distribution, financials, human resources and legal consolidations, mostly implemented by January 1995. Japan was last in April 1996, so we could use SAP's Multi-National Language Support to run Japanese on our single global database.

We see consulting as a controllable expense by choosing to train our own staff and leverage SAP consultants sparingly. That also kept valuable site-specific experience in-house when we needed to reconfigure to accommodate business model changes. There were trade-offs (including heavy recruiting of our staff), but consulting expense is your choice.

Getting the Right Start

Author: "Cindy F."

Pending final contract negotiations, my company—an industrial machinery manufacturer—is about to begin a "Big Bang" implementation of all SAP modules across four physical locations. There will be approximately 450 system users.

I would be interested in any suggestions panel members have regarding techniques that might be used for a project kickoff that will promote employee buy-in and send them away excited and motivated to embrace the changes before them.

Our company is well-aware that people issues will make or break this project, and we want to get things started on a positive, dynamic note.

Response: Things to consider

Author: Walter Curd, director of information technology, Fujitsu Microelectronics Inc.

Consultants will tell you to name the project and advertise heavily at this stage. We did neither. It is a long, grueling process, and there is no need to get the entire company hyped up that far in advance.

The most important thing you need now is executive commitment. That will be demonstrated by actions, not words. You also need:

1) Dedicated key users from each business area.
2) To tie the SAP implementation to the executives' bonus.
3) An executive steering committee made up of three to five members maximum to resolve key issues and be aware of progress.
4) An approved incentive/retention plan for team participants.

If you do these things, people will realize that you are serious about completing the project.

Response: Starting out right

Author: Karl E. Newkirk, partner in charge of the SAP practice, Andersen Consulting

People issues can make or break a project. An enthusiastic, comprehensive project launch is a great way to get everyone's attention and get things rolling. We have found that an "announcement communication," comprising a high-level project overview that includes an awareness presentation and a road show that includes site visits, is a successful way to kick off SAP implementations. The awareness presentation should be delivered by key project leadership members. The road show should be "set up" both in advance and on the day of the event by the appropriate senior manager in the organizational or geographical unit. This visible demonstration of sponsorship by the senior manager is critical to setting the stage for the impact that SAP will have on all areas of the organization. In addition, face-to-face communication is very effective in demonstrating sponsorship, commitment and the urgency of the project relative to other corporate initiatives.

Staff Retention

Author: "Chuck"

I'm interested to hear what companies have done to retain SAP-trained personnel. Particularly during a major implementation project, the loss of a key person could have a dramatic impact on your schedule. And we've found that you simply can't replace someone who has a high level of experience at your company with a consultant. We've tried to work with our salaried compensation department but haven't been successful. What have you seen in this area?

Response: Retention of key folks

Author: David Johns, director of global development, Owens Corning

Retention of key personnel is a huge concern for us. My recommendation is to be as proactive as you can on this issue. We are continuously working with our HR and compensation and benefits folks on the following:

1. At the project's inception, we established a very generous completion bonus for every project team member.
2. We established a quarterly 360-degree feedback process for all project team personnel.
3. We are constantly researching and establishing competitive market value compensation for each role on our project.
4. We pay for performance only—no historical-based merit increases.
5. We devote much time and budget to training.

I do believe, though, because of the competitive nature of the market today, we will have turnover. To offset that as much as we can, we also have in place a very proactive, continuous hiring process. We want to build as much bench strength as we can.

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Nowhere to Hide

Streamlined hardware, changes in the regulatory climate and the maturation of promising wireless technologies are ready to put your LAN, e-mail and most of the Internet in your pocket

BY JOHN EDWARDS

Before long, traveling employees will find it almost impossible to escape data connectivity, no matter how hard they try. Although just 660,000 people in the United States today use wireless networks to transmit data, Giga Information Group of Norwell, Mass., projects that figure will rise to 9.2 million by the year 2000. The market research firm also forecasts that the U.S. wireless data services market—including cellular, narrowband personal communications services (PCS), packet radio and satellite technology—will climb from $721 million in 1996 to $3.94 billion in 2000.

Almost daily, vendors are unveiling unique wireless technologies. Some of the most interesting products are those that infuse an existing communications system with wireless data capabilities. Cellular telephone Internet access, satellite e-mail and paging from a LAN are just a few breakthroughs that will soon be available to businesses nationwide. The challenge for CIOs will be to separate the truly useful technologies from those that simply offer dazzle and needless expense.

"There's no doubt that IS executives are currently facing, and will continue to face, a formidable array of wireless options," says David Roddy, chief telecommunications economist for Deloitte & Touche Consulting Group in Atlanta. "Sorting them out will require some research and plenty of patience," he says.

According to Roddy, this year's signing of the Telecommunications Reform Act helped spur growth in the wireless industry. He notes that the law has accelerated the implementation of intercarrier agreements, allowing several firms to share the cost of launching wireless products and services and speeding the nationwide rollout of new technologies. He adds that the law also makes it easier for wireless products and services to be bundled with other communications technologies, providing more comprehensive communications solutions.

Currently, wireless data products and services based on cellular digital packet data (CDPD) technology, such as packet radio, represent one of the mobile telecommunications field's hottest markets. CDPD tools offer mobile users continuous communications with their organizations' computer resources. CDPD provides an uninterrupted "virtual connection" to a host and most kinds of networks, allowing error-free data transmission in a wide range of environments. Using existing frequencies in the analog cellular telephone network and sending data in short bursts, or packets, CDPD is designed to give users access to e-mail and databases located on corporate information systems and, as of late, the Internet (see "Getting Unwired," *CIO*, Oct. 1, 1994).

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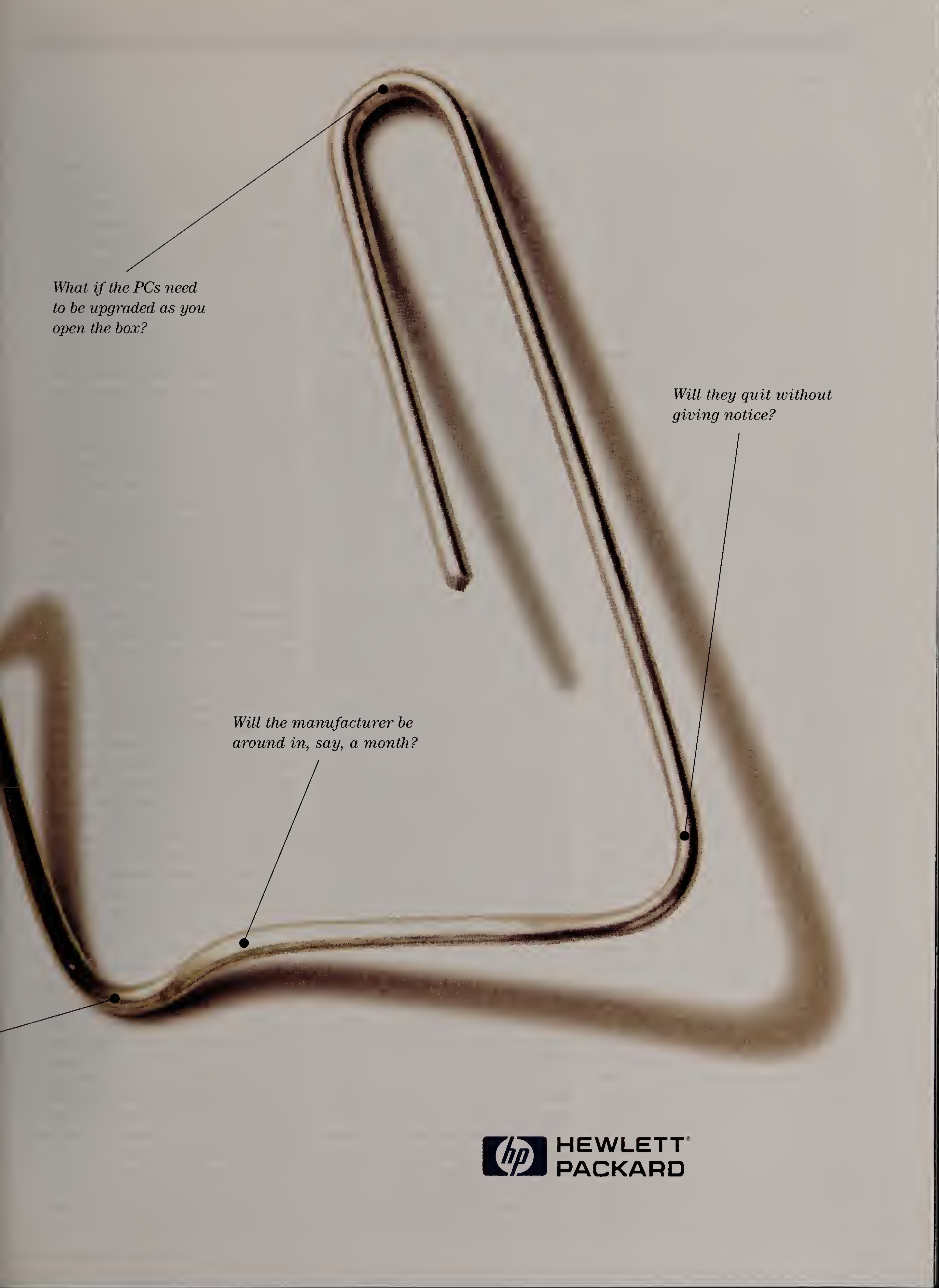

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CDPD technology is beginning to catch the attention of some of the biggest players in the telecommunications and computer industries. Last spring, for example, Microsoft Corp. demonstrated wireless remote access to its Microsoft Exchange Server using AT&T's Wireless Packet Data Service, the communication giant's version of CDPD. Microsoft Exchange Server, client/server-based messaging software, integrates e-mail, group scheduling, electronic forms and common groupware applications on one platform that can be managed by a single administrative program.

When used with a CDPD network, Microsoft Exchange users can send and receive e-mail as well as workgroup and other data to and from a network via the software's universal in-box. Data packets can be uploaded or downloaded at 19.2Kbps. Users pay for only the number of packets sent, not for the minutes of use or the total connect time. Microsoft Exchange also allows mobile users to work with data in innovative ways. Users, for example, can employ filters that limit the size of messages to be downloaded (restricting e-mail to messages that can be displayed on a handheld terminal's cramped display) or specify that no attachments be sent with messages (eliminating the possibility of receiving unexecutable files). The software also permits users to preview headings and view the size of pending messages.

Wireless access to the Internet via CDPD is another rapidly emerging field. Unwired Planet Inc., located in Redwood Shores, Calif., is one startup hoping to ride the airwaves to success. In July, the company introduced a suite of products and services designed to provide users of data-capable cellular phones, pocket communicators, two-way pagers and other portable information devices with limited Net access. With Unwired Planet's technology, users can get on-the-spot access to a wide range of information that can be made available through the World Wide Web. Applications and services are written in Unwired Planet's Handheld Device Markup Language (HDML), an open language that Unwired Planet has licensed to wireless hardware and service vendors such as AT&T Wireless, Ameritech, Bell Atlantic Nynex Mobile, Comcast Cellular Communications, GTE Mobilenet and Mitsubishi. Designed to meet the constraints of pocket-sized devices, HDML supports units with only a few display lines and a limited keypad. Most of the application processing occurs on standard Web servers rather than in the portable device, saving memory and processor power. The system's client software requires less than 100KB of memory.

The question facing CIOs isn't whether to adopt wireless technology but when and how.

Alain Rossmann, Unwired Planet's CEO and chairman, believes Web access will someday be offered as a built-in feature on virtually all wireless phones. "It's a natural feature to have, something that extends the telephone's traditional capabilities," he notes. "We're entering an age of having information available any time, anywhere." Rossmann also notes that "Web phones" may eventually replace the desktop computer as the primary method of accessing the Web. "I think we're headed that way," he says.

Another startup company working on wireless Internet access is CellPort Labs Inc. of Boulder, Colo. The company's MobileWeb product uses CDPD wireless connectivity and the Internet to link vehicles and fixed offices. A prime use for MobileWeb is fleet management. A global positioning system (GPS) receiver mounted within each vehicle can pinpoint locations to within a few yards. The technology allows fleet transportation, utility companies, public safety enterprises and a variety of other users to route vehicles around obstructions, monitor driver productivity and efficiently assign package or passenger pickups. In addition, customers can monitor the status of their deliveries in real-time through the Web. The company expects MobileWeb to be available as an option in new cars and trucks by 1999 for about $150.

But while CDPD is catching on in its various incarnations, don't expect it to challenge conventional wired technologies any time soon. The biggest drawback to CDPD is its service cost—less expensive than cellular or satellite communications but more expensive than traditional telephony options, according to David A. Bohmer, director of DePauw University's Center for Contemporary Media. "Whenever there's the option of using a land-line connection, even in a remote situation, you'll want to use the land line," he says. "Cellular is useful only in a high-mobility setting, such as in a moving car or truck."

Although CDPD is attracting a wide range of adherents, satellite data transmission is gradually becoming another wireless tool that CIOs—especially those who frequently travel internationally—can add to their mobile communications arsenal. Comsat Personal Communications of Bethesda, Md., is currently building Planet 1, a personal satellite communications service. Planet 1 combines near CDPD pricing with satellite technology to provide digital voice, fax, data and paging communications worldwide.

Planet 1 will be powered by an array of four Inmarsat-3 satellites with a maximum capacity of up to 2,200 channels. Scheduled to become fully operational by the end of 1996, Planet 1 uses a notebook-size terminal that weighs less than six pounds and a cellular phonelike handset that features a 3-line-by-10-character alphanumeric display. Other features include a 2.4Kbps Group 3 fax and Hayes-compatible data support, voice/fax mail notification and ISDN supplementary services support. The system will cost just less than

$3,000; air time will cost about $3 per minute.

Chris Davis, vice president of Comsat's personal communications, notes that Planet 1 is targeted at businesses with three types of mobile employees: international travelers who need instant portable communications worldwide; national roamers who have regional cellular coverage but travel domestically outside cellular coverage areas; and cellular extension users who live and work outside cellular coverage and need mobile communications capabilities. "For those users, Planet 1 can be both an efficient and cost-effective alternative to cellular-based systems," says Davis.

The pager market, which pioneered wireless data communications, is also evolving to face the emerging reality of two-way wireless communications. With conventional alphanumeric pagers now almost quaint, a number of companies, particularly veteran pager service vendors, have high hopes that two-way paging will be able to fight off competition from cellular, satellite and private wireless networks. As a result of two-way innovations, pager market growth looks solid for the next few years. Northern Business Information, a market research firm based in New York, forecasts that the number of paging service subscribers is expected to expand at a compound annual growth rate of 15.4 percent from 34.1 million in 1995 to nearly 70 million in 2000.

Washington-based SkyTel Corp., a subsidiary of Mobile Telecommunication Technologies Corp. (Mtel), is one of the two-way paging market's most aggressive vendors. The company's 2-Way paging service, which utilizes narrow-band PCS frequencies, enables users to send a brief, canned response (such as "will call later") to a sender's query. Internet support allows users to swap messages with pager users from a LAN or standalone PC. SkyTel's 2-Way also supports messaging through Microsoft Exchange Server. Press reports earlier this year indicated that 2-Way pagers are prone to losing messages and sending users garbled information. SkyTel indicates it has corrected the problems but is still recovering from the negative publicity.

The biggest obstacle facing 2-Way and similar paging services is the limited amount of data that can be exchanged by users. Incoming messages are generally restricted to less than 1KB, and outgoing information is limited to the canned responses.

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Despite these limitations, pager vendors plan to attract customers by offering cheaper rates than competing wireless technologies and by forging alliances with hardware and software companies. SkyTel, for example, has joined forces with Hewlett-Packard Co. to bundle 2-Way software into HP's 100LX and 200LX palmtop computers. The company also has a distribution agreement with MCI. To make sure it can withstand the competition, SkyTel and its parent have also attracted millions in investment capital from Bill Gates, Paul Allen and venture capital firm Kleiner, Perkins, Caufield & Byers. Overall, pager vendors hope their low-cost technology will prove attractive to a wide range of organizations—particularly those that need to keep in touch with employees who don't need full, two-way exchange capabilities but do require better, faster data communications than is possible with a standard alphanumeric pager. Pager vendors see sales representatives and service technicians as prime potential two-way pager users.

There is still plenty to debate. According to Deloitte & Touche's Roddy, the question facing CIOs isn't whether to adopt wireless technology but when and how. Roddy explains that organizations with many mobile employees, such as sales groups, will be the first to embrace wireless data products and services but that mobile data communications will eventually become ubiquitous.

But DePauw University's Bohmer says CIOs should use caution when considering the adoption of any wireless technology. He notes that it poses some risks that CIOs accustomed to dealing only with land-line systems may not have considered. "Expensive handheld terminals can be lost fairly easily; information can be intercepted by unauthorized parties; coverage can be spotty," he says. Over time, Bohmer says, all of these problems can be overcome, but early adopters should realize they are assuming the role of technology pioneers.

Despite potential pitfalls awaiting the unwary, Roddy thinks many CIOs should start evaluating wireless data systems. "Particularly if you have a highly mobile workforce, I think you pretty much must have it figured out by next year," he says. That doesn't mean you immediately have to plunge into the jungle, but I think a lot of companies will be setting their course in the next four quarters."

John Edwards is a freelance writer based in Mount Laurel, N.J. He can be reached by e-mail at 70007.412@compuserve.com.

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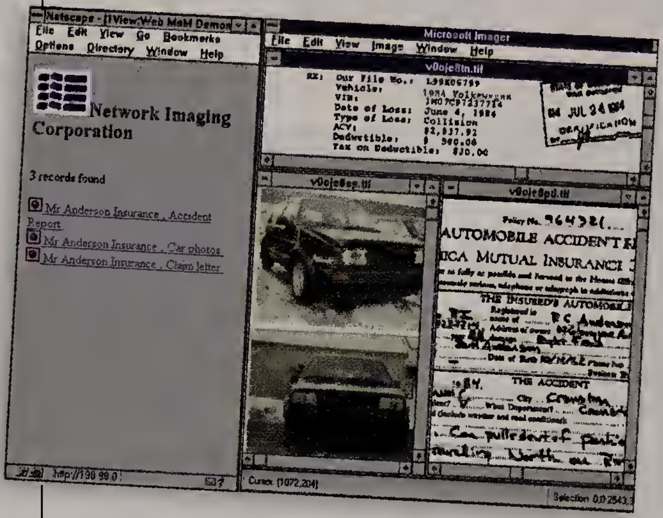
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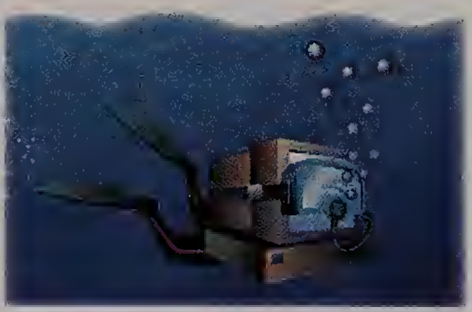

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Your title/function is:

○ CIO/Senior VP/VP
○ CEO/President/Owner
○ Consultant
○ Director/Manager of IS
○ Non-IS VP/Director/Manager
○ Other: ____________________

Last year, your company's revenues were:

○ Less than $100 million
○ $100 million to $299 million
○ $300 million to $499 million
○ $500 million to $999 million
○ $1 billion to $1.9 billion
○ $2 billion to $4.9 billion
○ $5 billion to $9.9 billion
○ $10 billion or more

What is the five-digit ZIP code of your place of work?____________

What is your industry?______________________________

At your company, is there a standard operating procedure to measure the effectiveness of new IT initiatives?

○ Yes ○ No

At your company, do you apply hard-dollar ROI criteria when measuring the effectiveness of new IT initiatives?

○ Yes ○ No

At your company, do you apply "soft" criteria when measuring the effectiveness of new IT initiatives?

○ Yes ○ No

We'd like to know what you know about electronic commerce (EC). (Darken as many circles as necessary.)

	This is an important element of EC	My company does this as part of our EC activity	My company does this on the Internet	My company does this on a private, value-added network	My company plans to begin doing this within the next year
E-mail	○	○	○	○	○
Fax	○	○	○	○	○
Ads or offers to sell	○	○	○	○	○
Order receipt	○	○	○	○	○
Order fulfillment	○	○	○	○	○
Customer support	○	○	○	○	○
Payments and settlements	○	○	○	○	○
List other functions of EC					
____________________	○	○	○	○	○
____________________	○	○	○	○	○

SOURCE: DELOITTE & TOUCHE LLP - "INFORMATION PROTECTION, YOUR BUSINESS, AND THE INTERNET"

We'd like to know how you feel about Internet security.

○ At your company, security questions leave Internet EC out of the question.
○ At your company, security questions affecting Internet EC will soon be solved.
○ At your company, security questions affecting Internet EC have been adequately addressed.

The tickets you'd most like to have:

○ Super Bowl Sunday
○ Stanley Cup playoffs
○ Monster truck rally
○ World Series
○ I'd rather walk on a beach
○ US Open Golf
○ NBA finals
○ US Open Tennis
○ Indy 500

Your favorite flavor ice cream is ______________________________

On "dress-down day" you:

○ Lose the tie
○ Draw on a completely separate wardrobe
○ Wear jeans
○ What's dress-down day?

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